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CHEMICAL AGE

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PACKAGES FOR CHEMICALS

ONCE regarded as a necessary evil by the majority of chemical manufacturers, packaging has now advanced to the stage where it can rightly claim to be a science in itself. Evidence of this comes from the fact that large firms generally have packaging departments while the smaller firms have either a full-time or part-time packaging expert on their staffs.

The packaging industry, however, is at the crossroads. The last few years have not only been marked by a great improvement in the quality of packaging employed in the chemical industry, but also by the advent of many new materials and methods. Many of these are clearly not quite good enough and mark a transition stage towards a better product.

There is still a tendency to use some of the newer materials to reproduce a replica of the container as it was made in more traditional materials. This phase is passing and the next few years will see the fullest possible exploitation of new materials by the production of completely new forms of packaging.

Many of the possible future developments in packaging for chemicals were reviewed at the packaging conference held at Buxton last week by the Association of British Chemical Manufacturers (for report see page 587). This conference, which gave the industry and its packaging suppliers the opportunity of discussing practical problems in the light of increasing competition, was initiated by the ABCM packaging committee which was formed at the beginning of last year.

Discussions at the conference revealed the increasing trend towards transport in bulk to the Continent, where packaging into drums, sacks, etc., would take place. A major difficulty to be overcome is the fact that with present costing it is cheaper to ship in drums from this country. This is a matter which must be taken up collectively with British Railways. Obviously a service of bulk transport either direct in special wagons or, as seems more attractive, in a remountable tank, must be used to the full if costs are to be kept down.

The suggestion was made that the chemical industry should collectively consider setting up bulk storage depots on the Continent with facilities for packing on the spot. Doubtless many will say the administrative problems are too great, but the idea is worth consideration for it should enable a transport service to be provided on the most economic basis.

The conference showed clearly the conservative nature of the British chemical producer. A number of delegates felt that all that was necessary in a heavy chemical container was technical perfection; in a competitive publicity conscious world, however, the package with the best presentation must have an edge over the dull one, provided that both are technically equal and that the product is of equal quality.

It was also noted that although the UK chemical industry is in the forefront of the world in producing new and exciting materials, it is slow to make use of them for its own purpose. Many of the newer plastics materials would provide ideal packaging materials for the paper sack, metal drum and fibreboard case trades. In some respects, these materials are not good enough by themselves, but tests already made indicate that in laminated form they might be ideal.

The cost of producing such packages in small quantities would be prohibitive, but as an industry the chemical manufacturers would be using them in hundreds of thousands or even millions. A barrier here is also the conservative nature of the package maker who, like most industrialists generally, prefers to meet an existing demand rather than to create a market for a new product. Perhaps a collective approach by the chemical manufacturers would provide a good answer. The ABCM packaging committee could with little difficulty discover what the demand would be for, say, a polyester laminate liner.

It would not be difficult then to persuade the package industry to produce a tailor-made container for a particular job at a reasonable price. Even with mass production, the price of a package in a new material might prove more expensive than that which a firm had been using, but against that would have to be weighed all the new properties of a superior package.

Some firms would no doubt prefer an individual package distinguishable from that of their competitors. As is the case when someone wants a special line, they would have to pay more for it, but even now two containers of identical materials, shape and size can be made readily distinguishable by the imaginative use of overprinting. If a manufacturer wishes to exercise his individuality then the proper place is in the quality of his product. The cost of packaging and materials handling can only be kept to a minimum by the use of standardised mass-produced containers. The package must be technically efficient, but it is still only of secondary importance to its contents.

US POLYTHENE BANDWAGON

WITH eight companies interested in low-pressure polythene manufacture in the US, there has been speculation in this country on outlets for an estimated 400 million lb. annual production. Main US producers are Phillips Chemicals (110 million lb. annual capacity), Carbide and Carbon Chemicals (55 million lb.), Polymer Chemicals—W. R. Grace (50 million lb.), Celanese Corporation (40 million lb.), Hercules Powder (30 million lb.), Koppers (30 million lb.), Koppers-Brea (30 million lb.). Texas Eastman have a semi-commercial experimental plant under construction, Spencer have a plant in partial operation, while Koppers have another pilot plant in operation. No capacity figures are available for these latter three plants.

It is therefore of interest to note that just over one year since LP polythene has been available in the US, at an initial commercial base price of 47 cents per pound, the price has been cut by 4 per cent per pound, a cut of 18½ per cent. The assumption is always made that the initial price is reduced as commercial manufacture gets under way and markets increase. But this cut has evidently caused US plastics producers concern. Price cutting was begun by Phillips, with a 2 per cent reduction and a further 2 cents reduction for large orders (400,000 lb. or over in six months). Hercules Powder followed suit cutting their price to 43 cents per lb. for carhead shipments of 20,000 lb. And in no time Grace and Celanese reduced their prices bringing them in line with Hercules. Although with one plant only in partial operation, Koppers are also to sell at the 43 cents-per-lb. level. Reasons advanced by the producers are that the new price pattern would stimulate sales, and that it would 'further widen the range of applications'.

At the start of this year, the market potential for low-pressure polythene was considered by US chemical economists. It was suggested that film would be a 'good bet'. It was emphasised that as there was not a great deal of this plastics material on the market, development of markets would be required. Also, that it took about a year to get a product settled, particularly if it was produced as an intermediate, as in the case of film where packaging valuation is necessary.

Another suggestion for use of low-pressure polythene is, of course, in pipe. Pipe manufacturers in Europe advise the use of this polythene for pipe which is not likely to be subjected to high pressures for any period of time. So further research is in progress, seeking ways and means (either by varying the polymerisation process, addition of stabiliser, or suitable blending) to utilise low-pressure polythene for piping. This additional research can only be an added cost factor.

The US polythene picture is, it seems, one of available capacity but with a need for potential markets. The sharp reduction in price suggests that stocks available have not been moving fast enough. Certainly the price reduction will affect the profit margins and might lead to some hardship for those companies with plants just starting up or yet to come on stream.

Another factor worth watching is the statement by Allied Chemical that they have a new polythene resin which they expect will compete in all sections of the polythene market. Allied Chemical's own low-pressure process is used and it is claimed that it is not covered by the Du Pont patent. An additional and significant factor is that the process appears to require much less capital outlay per pound of material compared with other techniques. It is reported by the company that the new polythene has been under test since the middle of last year and that small-scale marketing has been carried out for two months.

Not only is it likely that new developments in the low-pressure polythene will occur which may have far-reaching effects on established processes and plants, but there is the interest shown by many of the companies who have developed low-pressure polythene in other polymers such as polypropylene. Indeed, Hercules are already producing this polymer.

NEW NITRIC ACID ROUTE

BASIC discoveries in fixation of atmospheric nitrogen via nuclear radiation at the Rensselaer Polytechnic Institute have developed from original laboratory studies to pilot plant scale at Brookhaven National Laboratory. The Rensselaer workers have obtained yields of nitrogen oxides of the order of 5 to 15 per cent by exposing compressed air to radiation from uranium-235 at 150 p.s.i. or over and at a temperature of approximately 400°F. In the reaction, nitrogen and oxygen molecules are ionised and decomposed by fission fragments as well as by beta and gamma radiation.

Since the U-235 has to be in a finely dispersed form and in direct contact with the gas a nuclear reactor fuel matrix has been developed consisting of glass fibre into which has been incorporated the oxide of U-235. Use of the fibre has been found to provide a greater amount of fission recoil energy available, with a large surface area for good heat transfer.

It is stated cost of nitric acid using this radiation process will depend largely on efficiency with which nuclear energy is converted into chemical energy. Estimates suggest that at 50 per cent efficiency 1 mole of U-235 in 20-per-cent-enriched form (valued at $6,000) could produce about 70 tons of fixed nitrogen (valued at $10,000). Operation at a higher temperature level (500°F to 600°F), it is suggested, would permit generation of steam from a dual-purpose reactor and thereby improve the economics of the process.

There appears to be considerable interest in the US with regard to commercial exploitation of this method of fixing atmospheric nitrogen, at least two companies seeking to exploit the process by means of a prototype commercial reactor.

BRITISH OXYGEN'S UNDERTAKINGS ON RESTRICTIVE PRACTICES TO BoT

FOLLOWING the report of the Monopolies and Restrictive Practices Commission on the supply of oxygen and dissolved acetylene, (see CHEMICAL AGE, 1957, **77**, 119, 257, 539) the British Oxygen Co. Ltd. have made certain undertakings to the Board of Trade:

(1) They will not take over other producers of the gases with the object of adding to their monopoly position.

(2) They will not, either through British Oxygen Gases Ltd. or through any other associated company, make 'local and selective price reductions' for the purpose of eliminating competitors.

(3) No consumer has been compelled, or will be compelled, to use BOC apparatus in order to obtain supplies of gas. This, they state, would be the converse of the exclusivity terms which had been used in the company's standard gas supply contract. These terms provided that where BOC apparatus had been supplied, only BOC gas might be used with it.

(4) They will revise the terms under which gas and apparatus are supplied. They will sell such quantities of liquid or gaseous oxygen or dissolved acetylene as customers may seek, without the condition that all the customers' requirements of all or any of these gases should be bought from the company.

(5) Customers may buy at reasonable prices all gas-using equipment or, as at present, hire it from BOC. Where the equipment is sold outright, BOC will not require the customer to buy exclusively from BOC the gas used with the apparatus or any other gas. (Where customers use equipment which remains BOC's property, they may be required to take from BOC the whole of the gas used by that equipment.)

(6) They will make known their scales of prices for oxygen and dissolved acetylene (this has in fact already been done).

(7) All fixed price contracts with customers will be for periods not exceeding one year. Whenever such a contract is offered to a customer it shall be made clear to him that he has unconditional option of entering or not entering into it.

(8) Quotations for plant shall be based exclusively on the need to sell plant and shall be independent of the company's interest as suppliers of gas.

The commission's conclusions and recommendations were summarised in the annual report by the Board of Trade on the operation of the Monopolies and Restrictive Practices Act 1948 and 1953, laid before Parliament on 28 February 1957.

The Government do not at present intend to take any action on the majority recommendation that steps should be taken to regulate the level of the company's prices and profits on oxygen and dissolved acetylene.

Importance was attached by the commission to a substantial effort made by BOC in the field of research and development. The company state that a substantial effort has been made and will be made.

It was concluded that in the past it had been BOC's practice to take over or buy out other producers primarily, though not solely, to extend their monopoly. There was, however, no evidence that BOC were at present seeking to eliminate the small amount of competition that remained.

It was recommended that in future BOC should not make use of fighting companies to meet competition.

Monsanto Polythene Production Up

PRODUCTION and variety of polythenes manufactured by Monsanto Chemicals Ltd., have expanded during the last two years, particularly in the US. Chairman, Sir Miles Thomas, reports that the company is preparing, with technical assistance from the parent US company, to enter the polythene market with a full range of competitive products and to maintain an active development programme in this and associated polymer fields.

It is stated that during the current year an excellent start has been made on the construction of the polythene plant at Fawley and it is expected that it will be completed during this year. Several other expansion projects at Fawley are being studied. Other 'comprehensive programmes of expansion' are also under study particularly with intent to strengthen further the positions in rubber chemicals, oil additives, fine and heavy chemicals and styrene-based plastics. There is still space available for considerable development at Ruabon and Newport.

Sir Miles states 'We feel confident that with these and other developments and with our demonstrated increases in plant efficiencies we shall not only consolidate but increase our home and export business and take full advantage of any liberalisation of European trade.'

Success in last year's more difficult trading conditions is felt to be due in the main to the company's continuous campaign to improve plant efficiency, to the commissioning of new plant and to the diversity of operations. Sir Miles says, however, that he foresees no likelihood of relaxation in the current stringent trading conditions.

Details of Monsanto's sales and profits were announced in CHEMICAL AGE, 1 March, p. 404.

Patent Office Appointment Stands

REFERENCE was made in the 1 March issue of CHEMICAL AGE, p. 390, to the appointment of Mr. Gordon Grant, an under-secretary of the Board of Trade, as head of the Patent Office and the criticism raised by the Institution of Professional Civil Servants regarding the appointment. Last week Sir David Eccles, President of BOT received a deputation from the PCS led by Mr. Stanley Mayne, the secretary, which reiterated the objections to Mr. Grant's appointment. Mr. Mayne said that this appointment gave the Patent Department the distinction of being the only major Patent Office in the world which did not have a specialist head.

Sir David, however, will not alter his decision. He said that the staff represented by the deputation was engaged on work partly scientific and partly legal. The work of the Comptroller General covered a wide range including the administration of no less than four Acts—of which only the Patent Act required knowledge of science and technology. The appointment had been made with particular regard to the organisation problems facing the Patent Office at the present time, and without prejudice to the selection of future Comptrollers from within the office.

Combustion Additive Reduces Sulphur Corrosion

REDUCTIONS in sulphur corrosion have been obtained during a four week trial of a new combustion additive, Amber SSR 115, made by Amber Chemical Co. Ltd., 11a Albemarle Street, London W1. Carried out on seven Babcock and Wilcox boilers at a large installation in the north-east of England, the following results from the test are claimed:

(1) Reduction in sulphur corrosion as evaluated by the cold probe corrosion test of about 63 per cent.

(2) An improvement in boiler availability. When the trial began the boilers were badly fouled up. After three weeks on the Amber SSR 115 process existing deposits and slagging were virtually eliminated.

(3) A reduction of about 50 per cent in sulphur trioxide formation.

(4) A reduction in length of the smoke plume from about 10 miles down to about two miles.

Amber SSR 115 was fed direct into the combustion zone at the standard dosage of two lb. per ton of fuel. Cost of the treatment works out at about 1s 6d per ton of fuel.

Plastics Federation forms Fluorocarbons Section

As a result of recommendations made by an open meeting held at the offices of the British Plastics Federation on 4 March the fabricators' group management committee has formed a fluorocarbons section within the group to cater for the processors of p.t.f.e. Those eligible for membership are federation members engaged in the processing for sale of fluorocarbon polymers, e.g. polytetrafluoroethylene and polytrifluorochloroethylene.

★ THE OIL refinery's major output may gradually change from fuel for burning to raw materials for synthetic chemicals. Esso believe that the wide range of chemical compounds now produced from oil will be extended almost beyond belief by the time that atomic power is providing most of our energy needs. This confident prediction is given in 'Oil in a Future Atomic Age', an article in the current *Esso Magazine*.

In justification of this belief, the anonymous author states that chemicals produced from petroleum sources in 1947 totalled 12,000 tons, last year output had risen to 430,000 tons and within three years the figure will have more than doubled. By 1975 annual production may be some 2½ million tons. Already 42 per cent of all organic chemicals made in the UK come from petroleum sources and by 1975 the proportion is expected to grow to 90 per cent.

Of the 230,000 tons of rubber used each year in the UK, 20 per cent is synthetic and based on petroleum. Within 10 years, Esso predict that at least 50 per cent of all rubber used will be synthetic. A motor car tyre with a service life of 200,000 miles is forecast in the not-too-distant future.

It is in plastics where the greatest advances have been made and where tremendous development can still be expected. In 1953 production of thermoplastics totalled 100,000 tons; this figure was doubled by 1957 and will reach 300,000 tons by 1960.

★ THE NATURAL RUBBER producers of Malaya and the Federation Government have at last agreed to take steps on the report of the Blackman committee whose critical examination of the industry and proposals for its future progress in the light of competition from synthetic rubber were issued last year. CHEMICAL AGE, 21 September, p. 441, carried an exclusive account of the report, the circulation of which was restricted.

Professor E. G. Blackman and his colleagues recommended that the producers should aim at good quality rubber to sell at not more than 60 and possibly 55 Malayan cents per lb. (f.o.b.). Better coordinated research with the aim of producing rubber of a form and quality which would meet industry's requirements was seen to be the basic need. It was stated that efforts should be intensified to rectify as far as possible the known shortcomings of the natural product.

The producers and the Federation Government have now agreed that the committee's recommendations are generally acceptable. To implement them as quickly and as vigorously as possible, the research cess collected on all exports of rubber from the Federation has been increased from 0.5 to 0.75 cents per pound.

★ HOW MUCH can a graduate expect to earn on entering the chemical industry? Initially he will probably get about £700 a year says Sir Miles Thomas, Monsanto Chemicals chairman, writing in *The Times* supplement, 'Careers in Industry', on Tuesday. A man or woman with a Ph.D. degree might receive £150 a year more.

By the time he is 30 to 32, the graduate should be earning £1,200 a year, while in the higher ranges a works manager, usually recruited from the production side, in charge of a factory of about 1,000 employees would receive more than £2,000.

Sir Miles stresses that the doors of the chemical industry are not closed to the young man or woman who has not gone to university or technical college. There are prospects of work as a laboratory assistant with the opportunity of studying for a degree or comparable qualification.

Although work for women in chemicals is confined mainly to research and analysis, Sir Miles believes that the day is fast approaching when they will be given wider responsibilities in the factories.

★ FIRST plant to be built in the UK by Cyanamid of Great Britain Ltd., for its Lederle Laboratories Division, makers of the antibiotics aureomycin and achromycin and other pharmaceuticals, will be inaugurated at Gosport, Hants on April 15. The £700,000 factory occupies a 16-acre site bordering the main Gosport-Fareham road.

Sir Alexander Todd, professor of organic chemistry at Cambridge, will make the inaugural speech at a lunch to be attended by nearly 250 guests. Other speakers will be Mr. O. N. Williams, managing director of Cyanamid of Great Britain and Mr. Kenneth C. Towe, chairman of the world-wide Cyanamid organisation.

Employing nearly 300 people, the new plant was designed to meet the needs of modern pharmaceutical production. Its inauguration marks an important development in the growth of the UK company which has operated in this country for more than 30 years. The plant replaces the company's Hirwaun, South Wales factory, which was taken over for the manufacture of Lederle products in 1950

Construction took 15 months, less than half the normal time, due largely to the preplanning techniques of the builders, CAS (Industrial Developments) Ltd. The plant has been in full production since 1 January.

★ MR. H. H. BAGNALL, Birmingham city analyst, has brought into proper perspective a chemical leak scare last November when there was an accidental leakage from the phosphorus plant at the Langley works of Albright and Wilson. Many people were afraid at the time that their food and drink might have been affected.

Mr. Bagnall's department examined samples of food and found them quite free from taint. Judging from the widespread character of the complaints, he feels that there was originally some justification for them, although the traces of the chemical absorbed were quickly dissipated.

It is thought possible that effects produced were at least partly due to the upper respiratory passages being full of polluted air rather than to any actual taste of the food eaten. In the case of some biscuits sold loose from a tin and later kept in a tin, a 'faint but quite definite unpleasant taste was still apparent on the following day, although this disappeared after the biscuits had been chewed for a few moments'.

★ THERE can be little doubt that there is a lively interest in new forms of packaging. The ABCM conference at Buxton was good evidence of that. Also my note last week of the newly-designed polythene and hardboard containers used by Charles Windschuegl for their formic acid led to the company being inundated with requests for supplies of the container.

I was misled into believing that Windschuegl themselves make this polythene 'jerrican'. Although they do not claim to be suppliers of packages, I have no doubt they would be delighted to supply these containers full.

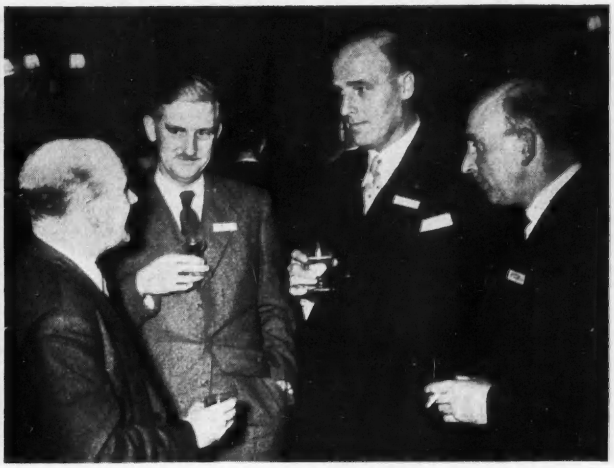
★ THE USE of Hickson's Tanalith C timber preservative is enabling the Nigerian Government Railways to use timber sleepers in place of steel ones, used to prevent attack by termites and heavy decay that would be experienced with untreated timber. For the first time Nigeria, a timber exporting company, is able to employ her own timber on rail and telecommunications projects. This should save the country many thousands of pounds a year.

The two processing plants installed in Nigeria are each capable of permanently preserving with Tanalith C 500,000 sleepers each year. Both plants are owned and operated by Nigerian Railways. A third Hickson's plant is being installed at Ibadan for the treatment of telephone poles. With a capacity of 15,000 poles a year it will come into operation in May. At present Nigeria's telephone poles are being made in concrete.

Two other plants using this preservative have been used for several years in Ghana, one for the treatment of telegraph poles, the other for timber used in the Ashanti goldfields.

Alembic

ABCM PACKAGING CONFERENCE



At the Shell Chemical Co. reception, l. to r. A. Jamieson (W. J. Bush and Co.), W. Alderton (Fisons), W. L. Yearsley (W. J. Bush, Widnes); C. J. MacArthur (ICI paints division), R. B. Skinner (ICI lime division), C. C. Hazelwood (Metal Containers) and C. D. Callieu (marketing operations manager, Shell Chemical Co.) chairman, conference organising committee

Developments in Chemical Containers Discussed at Buxton

MORE than 130 delegates and guests attended the first packaging conference to be held by the Association of British Chemical Manufacturers at Buxton last week. They represented producers of both heavy and fine chemicals as well as package manufacturers.

Discussion centred mainly on heavy chemicals but various aspects of fine chemical packaging were considered. Matters covered ranged from materials handling, bulk transport, to the various types of packages. The emphasis was on newer forms of packages, and future packaging materials. Several novel forms of transport and handling were considered in view of the possible need to meet increasing competition in Europe.

The conference was arranged by a subcommittee of the ABCM packaging committee with the assistance of Mr. A. Holden, ABCM general manager. Conference chairman was Mr. G. H. Edwards, packaging adviser to Unilever Ltd., and packaging committee chairman. Mr. A. H. Williams, Shell Chemical Co., was conference secretary.

The three conference papers were as follows: 'Packaging and distribution of chemicals, their vital role in the export field', by R. E. Rushen, export sales manager, ICI Ltd.; 'Packaging and handling for an expanding European market', by G. Downie, material handling executive officer, Unilever Ltd.; and 'Technical problems in packaging for the European free trade area', by Dr. G. L. Riddell, head of packaging research and development, Reed Paper Group.

An open forum on packaging problems was held and in addition there were three discussion groups, held simultaneously, on metal drums, jute and paper sacks, and plastics containers.

Four works visits were undertaken to: the drum works of Metal Containers Ltd. and the paper sack and fibreboard case factory of Bowaters, at Ellesmere Port, to the ICI limestone quarry and Shell Mex and BP Ltd. at Buxton, the latter including a visit to the drum reconditioning plant of Victor Blagden (Manchester) Ltd.

Chief guest at the conference dinner on 19 March was Sir Hartley Shawcross. Other guests were: Mr. George Brearley, ABCM director; Mr. J. Castle, chairman, Institute of Packaging; Mr. V. Gordon-Saker, Reads Ltd.; Dr. V. G. W. Harrison, director of PATRA; Mr. Bernard Hickson, ABCM chairman; Mr. L. B. Ryder, chairman, ICI lime division; Mr. E. C. H. Tickle, Metal Containers Ltd.; and Mr. S. S. Wade, Victor Blagden (Manchester) Ltd.

On 18 March, those present were entertained to a cocktail party by the Shell Chemical Co.

The open forum and discussion groups will be reported next week.

Cadillac-type Finishes Not Wanted

CHEMICAL manufacturers should not worry too much about 'glamour' in heavy chemical packages. A sound package, clearly and durably marked and of a size and weight to suit the customer would earn far more goodwill than gaudy colours, fancy designs or 'Cadillac-type' finishes. That was stated by Mr. R. E. Rushen in his paper.

Mr. Rushen summarised the answers that a chemical plant manager, shipowner and export customer would probably give to the question 'What is a package?'

The plant manager wanted a package which would ensure that his chemicals would reach the customer in perfect condition. There were other considerations. Firstly the container must handle and store easily; a variety of shapes, sizes or weights was not welcome.

The shipowner's needs were simple. He first looked for strength so that despite mishaps the chemical would stay in its container and would be no hazard. Packages should be easy to stack. The chemicals would be more than welcome if they could replace normal ballast. Mr. Rushen stressed the importance of package strength, saying that any improvements made in the preparation and presentation of packages should in no way undermine the safety factor.

The overseas customer, who might be a consumer or a wholesaler stocking a wide range of chemicals, shared many of the plant manager's views, but there were important differences. The customer would not want to translate English weights to the metric system. The US customer, used to a drum containing 100 lb. of product would certainly not welcome a drum containing the odd amount of 112 lb.

While he wanted a well-sealed container, he had to open it, which was one aspect of packaging that seemed to be overlooked by the plant manager.

Mr. Rushen called for closer co-operation between the people who make and those who pack chemicals. Success in an FTA would depend in no little measure on the 'backroom' boys being given the opportunity of travelling abroad to see what the overseas customer wanted.

On the subject of bulk transport, Mr. Rushen thought that both solids and liquids would increasingly be carried in bulk by road. If they could deliver direct from UK works to the continental consumer, the UK manufacturers would be in a much better position to meet the offers of their competitors, even though cost-wise they must be at some disadvantage because of the distance involved.

BULK RAIL TRANSPORT CHARGES TOO HIGH, SAY DELEGATES

SEVERAL delegates at the first session were concerned at the high cost of bulk transport of chemicals to the Continent and wanted the ABCM to approach British Railways, either direct or through the Board of Trade, on behalf of the chemical industry. This arose during the discussion following Mr. Rushen's paper.

Opening the first session Mr. G. H. Edwards (Unilever Ltd.) conference chairman, introduced the session chairman, Mr. J. M. Butler (Lewis Berger and Co. Ltd.).

Mr. Butler said that in the US, packaging represented well over 2 per cent of the total gross national product. The US chemical industry used 17½ per cent of all metal cans in 1956; 4.7 per cent of textile bags; 82 per cent of steel barrels and drums and 65 per cent of steel pails.

Importance of Paper

In the packaging raw material field paper was the most important product, valued at $3,700 million a year, 60 per cent higher than in 1947. Output of metal containers, which rose four times between the years 1939 and 1947 and 85 per cent since 1947, was valued at $1,850 million. Glass containers production, valued at $650 million, increased almost fourfold since 1939, but only by 44 per cent since 1947. The newer materials, such as films, foils, plastics and chemical accessory products such as adhesives, cushioning and cements had taken third place at a turnover of $1,333 million dollars, having increased output 5½ times since 1939 and by 138 per cent since 1947.

Mr. Butler felt that the US trends were a guide to developments in this country.

Referring to the question of bulk rail transport in his paper, Mr. Rushen spoke of the need to look increasingly to this method. British Railways should take note of this new trend in transport and reconsider their costing of rail tank carriage. To illustrate this he told how his own company had quoted in non-returnable drums and in rail tanks for a customer in Scandinavia. Rail transport was found to be more expensive even allowing for the inclusion of the drums which were quite expensive.

Pressure would have to be brought in the right quarters so that rail and ferry rates would enable them to compete on reasonable terms with continental firms.

Asking the first question on this subject, *Mr. F. H. Walmsley* (British Industrial Solvents Ltd.) declared that there was something wrong when it cost more to use bulk transport to the Continent than to ship in drums. He asked, 'How can we stimulate British Railways to think of fast and cheap transport?' The direct approach by individuals brought no result at all.

Mr. Rushen felt they should co-ordinate their approach through the ABCM. If that was not possible then the interested firms might get together and make a démarche to British Railways.

Mr. L. W. Stubbs (Albright and Wilson, London), supported the idea of a joint approach to British Railways and asked if it was becoming a regular practice to reduce costs by holding large stocks on the Continent.

Mr. Rushen said that ICI did that to an increasing extent because it was not possible to cope with bulk business unless large centrally located storage points were used. The Americans were well advanced in that field and he had a feeling that the British chemical industry was being a little left behind.

'Buy a Ferry'

Mr. C. D. Callieu (Shell Chemical Co. Ltd.) thought that ABCM could best approach British Railways through the Board of Trade. He felt the industry could well set up distribution points on the Continent on a joint basis so that all members could make use of bulk facilities. If they did not get any sense out of British Railways he suggested that the chemical industry might buy itself a ferry.

Mr. George Brearley, ABCM director, said that the council's free trade area committee had met the previous day. It appreciated the importance of bulk materials transport and he thought it would put to the ABCM traffic committee this question of approaching British Railways.

Another question discussed at length was whether the design of the pack had any influence on the sale of heavy chemicals. This point was raised by *Mr. C. Swinbank* (ICI, Manchester). Mr. Rushen's view was that bright presentation would not influence a sale, but that bad packaging would be a bar to repeat orders.

Mr. Butler felt that when two competitive products were equally well packed, the attractive package would score over the less glamorous one.

Mr. A. F. Much (ICI, Manchester) spoke of the conflict between the cost of meeting export needs in the way of special packs, and the desire to keep down the cost of packaging.

Mr. Rushen felt there would be little difference in costs in providing a 50-kilo drum against a 1-cwt. drum. He did not suggest they should use luxury containers but stressed that continental manufacturers were prepared to give the customer the type of drum he wanted.

Mr. K. D. Mantle (ICI, Manchester) was told by Mr. Rushen of an ICI scheme to pass back complaints about faulty packs. Use was made of coloured photographs which were said to have a much greater impact on the producer than an overseas agent's written report.

Part of the crowded conference hall for the first session

Chemicals May Be Exported By Airlift or Parachute Dropped

AIRLIFTS, parachute drops, demountable containers for two-way trips and specially constructed 'inner spaces' for ships. These were some of the possible methods for bulk handling of chemicals that might be explored in the future mentioned by Mr. George Downie in his paper on 'Packaging and handling for an expanding European market'. The scope of the paper was widened to consider other than purely European considerations.

He felt that industry might have something to learn from the Berlin airlift in which the weight of the packaging represented only 6 per cent by weight over the whole range of foodstuffs carried. He spoke of the double-skin plastics containers used to drop petrol and other necessities to troops in Burma during the war. The possibility had not yet been fully explored of parachuting supplies of suitable materials into locations where they could be dealt with. Suitable fork-lift trucks could rapidly clear the pre-packed bales, hampers or pallet loads.

For two-way traffic, the demountable pressure vessel had a claim to further attention. Handling men should liaise with naval architects to make bold advances in the realms of ships' 'inner spaces'. It was up to the users to press for such modern developments and to make full use of them when provided.

Dealing with the cost of handling, Mr. Downie estimated that £13.6 million a year was spent in the chemical industry on handling alone. A deliberate effort to save 10 per cent of that figure would result in the saving of about £1.4 million a year.

In the chemical industry, the cost of handling would be of the order of 33 per cent of the cost of production. Mr. Downie asked whether the UK was right in selling 'f.o.b. UK port', since most competitors sold 'delivered to destination'.

Special container ships were being built for the North Irish Channel crossing,

where more than 26,000 containers were carried each year. He asked whether such a service should be developed for the English Channel.

Speaking of the advantages of palletisation in bulk handling, Mr. Downie said that a number of leading companies concerned with fine powders, such as bichromates, bicarbonates, polythene moulding powders, etc., were considering the provision of bag formers which would, without damaging the contents, shape the filled bags so that they could be more readily palletised. Alternatively there was the stressed-skin type of package using Sisalkraft or similar wrapping, with its re use value.

Could UK Compete on Level Terms?

Opening the discussion, *Mr. L. W. Stubbs* (Albright and Wilson), asked Mr. Downie if he felt that British Railways could give a bulk service that would allow the UK manufacturer to compete on level terms with his continental competitors. He wondered if a ferry service could be provided.

Mr. Downie did not think they could expect to get a rate below the actual cost of providing the service. The industry had to tackle the problem of meeting competition by doing things more efficiently and cheaper than was the case on the Continent. He felt that handling costs could be brought down.

Mr. T. H. Hilton (Joseph Crosfield and Sons), had a three-part question. He asked about the advantages of a European pallet pool; if European customers should be expected to accept UK methods or packages or if our standards should be changed; and he sought Mr. Downie's views on British Railways' attitude towards providing suitable wagons to carry chemicals to the Continent.

Pallet Pool

Mr. Downie felt there were distinct advantages for a pallet pool. Under a Swiss Railways scheme, the user contributed 50 per cent of the pallets he was likely to use. There was a saving in capital investment and customers' handling arrangements were greatly facilitated. He answered the second question by saying: 'The customer is always right'. He thought that British Railways would give the industry what it wanted, but he questioned whether the fixed chassis rail vehicle was the most economical method of moving chemicals in bulk. Mr. Downie felt that the demountable container was a better proposition.

In reply to *Mr. A. Roche* (Monsanto Chemicals), he said that so far the chemical industry was making little use of pallets. Unilever had looked at the question of exporting catalyst in box pallets to South America. Trials had proved successful. The pallet was not expendable and was made use of by the consignee.

Summing up the discussion, *Mr. E. G. Whitaker*, transport adviser to Unilever Ltd., said he would like to see the status of packaging, handling and transport staffs raised. They should be consulted earlier when matters affecting them were being discussed.

L. to r., E. W. Carey, J. H. Digweed and A. W. Cowley, from BX Plastics, Manningtree; E. A. Evans and S. Davies (BIP Chemicals, Oldbury)

Dr. Riddell Discusses Heavy Chemical Packs of the Future

SOME of the developments likely to be seen in the packaging of heavy chemicals in the event of a European FTA were discussed by Dr. G. L. Riddell.

Dr. Riddell, pointing out that the full effects of free trade would not be felt for some 12 to 15 years, urged UK chemical producers to make an early study of the probable marketing conditions in the EFTA and to co-operate with their suppliers in finding out what packaging was needed to fulfil the needs of transport, handling, warehousing, distribution and customer acceptance. There was no short cut, each market had to be examined for each kind of chemical.

The decisive sales factors in an EFTA would be service and convenience, and the package would play a big part. The packaging problems for an EFTA were: convenience to the producer, transporter and the customer; and cost, which had to be as low as possible.

One of the important questions to be considered was 'where shall one pack if smaller than tank lots are required. Is one to pack at the point of manufacture or is one to ship in bulk to the Continent and repack there? The answer to this question may affect the kind of package you will find most convenient and cheapest.'

For example if a liquid chemical was being shipped to Italy, a glass carboy might be out of the question if the packaging were done in the UK, whereas if it were sent in bulk to Italy and there put into returnable carboys, they might be an economical and convenient pack.

Dr. Riddell then discussed some chemical packages to see what their limitations were and how they might develop under the pressure of competition.

Carboys. The glass carboy, which had disadvantages as far as exports were concerned, would be replaced probably by a reinforced plastics container. Two possibilities now on the market were the metal clad polythene drum or the plastics liner to a fibreboard case or drum; neither was the complete answer, however. The future might see a stronger, lighter, straight-sided or rectangular carboy.

Metal drums. There must be an increasing tendency towards the lightweight, low-cost non-returnable drum. Developments visualised by Dr. Riddell were improvements in closures and a move towards drums of square section. To obviate dangers of rusting and consequent contamination, there would be a greater use of plastics liners, the use of aluminium or tinplate drums or the use of suitable protective lacquers.

The trend towards bulk transport to the Continent, with packing on-the-spot might mean that the package would be shipped along with the product. In that event, the drum makers might ship drum bodies flat and erect them at the packing point by reconverting the bodies to a cylindrical shape and putting on the ends.

In the field of non-metallic drums, phosphoric acid was being shipped in the US in fibreboard drums. On the Continent, plywood drums were used for a wide variety of powders and liquids.

Sacks. Dr. Riddell expected that the multi-wall paper sack would extend into new fields, but various improvements would be sought. Firstly, the sack must give greater strength at no greater cost. It must be resistant to the penetration of water, water vapour and other gases to prevent caking. This meant not only the use of plies of suitable barrier materials, but better methods of closing. Another major problem was that of opening and resealing.

The multi-wall sack of the future would comprise plastics and metal foils as well as paper. There would be competition from the plastics sack, made possibly from a multiply extruded film. Already sacks of polythene, p.v.c. and Melinex were being used experimentally in the chemical field.

Like the glass carboy, the jute sack to be economically sound in the export trade had to be returnable. In the post-war fight between jute and paper sacks for chemicals, the honours had gone to the paper sack. He did not expect that that position would be reversed in an FTA.

Cylinders. Dr. Riddell knew little about cylinders, but he imagined that the welded cylinder instead of the drawn tube would be more widely used in the future.

Cases. Fibreboard manufacturers could be expected to improve the wet strength of their cases and to improve their capacity

to carry heavier loads. Much had been achieved technically, but the economics were the stumbling block. Internal fittings would be improved to give better protection. The demand for brighter decoration would be stimulated by an FTA. Apart from its use as a 'retainer', Dr. Riddell thought the fibreboard case would be more widely used as a chemical 'container'. Greater use would be made of these cases with plastics liners for liquids and pastes.

Like the paper sack, the fibreboard case of the future would include in its construction materials other than paper.

Cost and technical difficulties in manufacture and use suggested that the day of the glass/fibre-resin case had not yet arrived.

Bulk Containers. The relatively new intermediate bulk container with a 1,000–3,000 lb. capacity deserved the chemical industry's close attention. In many cases handling devices were simply a hoist or a dolly. For pastes and viscous liquids, such a container might be a large plastic collapsible tube, emptied by rolling up the end farthest from the nozzle and returning in the rolled up state.

Another type of intermediate bulk container might be the large paper sack contained in a collapsible wire mesh crate that was collapsed for returning. A non-returnable type was the large fibreboard case with or without a liner, which could stand on an expandable fibreboard pallet or on a wooden pallet, the whole being secured by steel strapping. The 100-gall.-upwards tank, collected when empty, had excited interest in the US. Those devices were now being looked at seriously in this country for the delivery of both wet and dry chemicals.

Summing up, Dr. Riddell could see no way of short-circuiting the need for a series of case studies dealing with each group of chemicals in turn in each of the EFTA countries. Having got the technical and economic facts together, laboratory tests and finally experimental shipments must be made. Small firms without skilled packaging staffs could obtain advice from Printing and Allied Trades Research Association (PATRA), BSI and packaging suppliers. The BSI was planning to look into the standardisation of packages. Not only were there problems concerned with the conversion of pounds and gallons into kilos and litres, but many continental countries were keen on standardised sizes for packages and pallets.

Polypropylene and Polyformaldehyde as Possible Future Packing Materials

OPENING discussion on Dr. Riddell's paper, session chairman *Mr. G. H. Edwards* (Unilever) said they had discussed the question of bulk storage depots on the Continent. That worked both ways and under a FTA they could expect that continental producers would open depots in the UK.

Mr. E. O. Rounsefell (Laporte Chemicals) describing the polythene carboy as being attractive in the solid form, said his firm did not wish to sheath it in metal because of possible spillage of corrosive materials while packing. This would become a 'one-trip' package but the main disadvantage now was one of cost.

Dr. Riddell thought the price would come down with greater usage. *Mr. R. H. Birtles* (ICI) agreed with that but pointed out that so far as the raw material was concerned the great drop in the price of the polymer had already taken place. He did not think there would be any further major reduction in the next few years, apart from a 1d. or so. Any appreciable drop in the price of the carboy would have to come from the carboy producer. Eventually the use of high density polythene might enable thinner and cheaper walls to be used.

Of the pure polymers, polythene was the most popular because of the large manufacturing capacity (700,000 tons). It was unlikely that any new polymer would come along for many years.

Materials with exciting possibilities were polypropylene, perhaps more as a film than a moulding powder, the new US polyformaldehyde, claimed to be similar to nylon and rather cheap, and the potentially competitive polycarbonates. All these were in their infancy.

Mr. C. D. Callieu (Shell Chemical) suggested that Mr. Rounsefell should consider the 'sausage' type of container. This would not do for certain liquids, said Mr. Rounsefell, because they could not be retained in such a package. Some were not merely noxious, but they were also exceedingly dangerous and it was not thought wise to bulk-pack them.

Mr. A. A. Capewell (Bakelite) wanted to know if the sack makers could by variations in gusset size produce a bag which would enable the user to take up the difference

G. H. Edwards (Unilever) opens the conference

when handling a number of products with variations in density.

It was a fallacy, declared Dr. Riddell, to assume that much could be achieved in this respect. It was not technically possible to do more than a little to help in this way. He suggested that packing by volume rather than by weight might help in enabling a standard size pallet to be used.

He told *Mr. J. W. Crewe* (Monsanto Chemicals) that some expendable fibreboard pallets had a fibreboard base with tubular legs. Tests had proved encouraging.

Discussion on regulations concerning the transport of chemicals and permitted containers was initiated by *Mr. W. M. O. Rennie* (ICI Billingham). He said that for some types of chemicals the UK exporter had to adhere to a particular package, yet when imported the same products were packed in a variety of containers.

Mr. F. H. Walmsley (British Industrial Solvents) said that the Ministry of Transport RID regulations represented an international convention governing rail transport. Road transport was still in draft form. The UK had ratified and implemented the RID code, but other countries had yet to follow suit. Goods leaving this country should all conform to the regulations; those arriving in British ships should also do so. But until all countries worked the regulations there would be some differences.

Dr. Riddell told *Mr. L. W. Stubbs* (Albright and Wilson) that an international standards committee was at present considering nomenclature and in about a year would start work on drafting standards for various types of packages.

Mr. T. H. Hilton (Joseph Crosfield and Sons) asked if there was any reason why alkalis and allied materials should not be packed in plastics liners to fibreboard containers and whether such a method would be acceptable to the shipping conferences.

Dr. Riddell could see no objection, subject to compatibility and the nature of the alkali. He thought that initially the method would not be accepted.

Machines Developed for Work on Radial Seals

EXPERIMENTAL work on radial seals has been considerably expanded at the British Hydromechanics Research Association, Harlow, says the report for October 1956 to September 1957. Three machines are now available for studying this type of seal.

It has been shown that under certain conditions the seal faces become completely separated by a liquid film so that unavoidable leakage occurs. Liquid pressures in this film are thought to be considerably higher than those in the bulk of the liquid, causing anomalous leakage flow. A reliable electrical method of measuring seal face separation has been developed so that it is possible to study the properties of the liquid film and the conditions under which it occurs.

A new apparatus in which the seal is represented by a pair of plane parallel thrust plates has been built to study film conditions. The self-generated liquid film has been shown to withstand several hundreds of pounds thrust load in the absence of applied liquid pressure and without metallic contact.

A study has been made of the turbulent spreading of the very large cooling water discharge from a nuclear power station into relatively shallow water.

Laboratory tests supported by large-scale field tests have shown that the mixing is similar to that of a slice from a theoretical plane jet and that in this particular case the diluted jet of warm water would spread over a sufficiently large area to allow the waste heat to be dissipated by evaporation from the surface.

Even in the most adverse conditions, reports the association, there would be negligible temperature rise at the cooling water intake due to recirculation, and little danger to fish life.

UK SUPPLY OF CHEMICAL ENGINEERS SURVEYED

BY 1966, with adequate support, this country could provide 950 chemical engineers a year, as compared with just under 300 in 1956. This is a better increase than the goal for scientists and engineers as a whole given in 'Scientific and Engineering Manpower in Great Britain' (HMSO, 1956), but falls short of the estimates of some leading chemical engineers.

This statement is contained in a survey of output of chemical engineers in Great Britain carried out by the Institution of Chemical Engineers, which is based on replies to a questionnaire sent out by the institution to professors, technical college principals and heads of department in this country.

The total number of chemical engineers employed in Great Britain in 1956 was stated in the report 'Scientific and Engineering Manpower in Great Britain' (1956) as 1,500 and the total estimated number required by 1959 as 2,200—an increase of 47 per cent. Output from universities alone should be sufficient to meet this requirement. At the time of its publication, the total number of graduate and corporate members in Great Britain was approximately 2,100 as against the figure of 1,500 given in the report. An estimate by the institution in February 1956 gave the country's need for chemical engineers by 1966 as 1,100 a year. A petroleum industry spokesman said the figure should be 1,500 a year by 1966 and a chemical industry spokesman estimated the figure at 1,000 a year.

This four-fold increase represented in the figure of 1,100 by 1966 is not out of keeping, however, when it is recalled that the growth-rate of the chemical and allied industries is 7 to 8 per cent per annum, compared with 4 per cent per annum for all industries.

The following table shows that with adequate support 950 chemical engineers could be provided by 1966.

Table 1

	No. qualified in			Estimated output in	
	1949	1953	1956	1959	1966
University (First degrees)	68	116	171	35	512
University (Post. grad. dip.)	31	65	51	106	117
Technical Coll. (Post. grad. dip.-type courses)		8	9	25	310
Technical Coll. (Other full-time courses)		14	10	14	
Technical Coll. (Sandwich courses)			5	72	
Technical Coll. (H.N.C.)			28	139	
Technical Coll. (Other part-time courses)			3	20	
Totals	203	277	727	939	

The survey suggests that the prospects in chemical engineering appear to be good, but there are no grounds for complacency having regard to Russia's training of three times as many professional engineers as this country.

Reference is made to the real and widespread difficulties in obtaining teaching staff which have been reported in the individual reports returned with the questionnaire replies. There is also the risk of some reduction in quality as a result of the difficulties experienced. In general, the situation in the technical colleges is worse than in the universities.

The survey indicates that, by and large, university teachers of chemical engineering are not very hopeful about the expansion of part-time day teaching by members of the staffs of industrial concerns. What is required is the secondment from industry to teaching duties of qualified men without loss of seniority for periods of not less than six months. It might be productive for instance, the survey considers, to seek the release from local industry of an old student or a man with part-time evening teaching experience.

It is stressed that the help which industry has already given, directly or indirectly, has borne fruit, but there is justification for more interest and support not only in the problem of the shortage of teachers but also in the extension of student apprenticeship schemes coupled with university degrees and diplomas in technology (sandwich type schemes) and Higher National Certificate (part-time day release).

An essential feature of a fully-developed chemical engineering teaching department is a vigorous research school. Table 2 is based on replies to questionnaires.

Table 2

	1953	1956	1959	1966
No. of University research degrees in chemical engineering	28	47	131	160
No. of research degrees as a percentage of first degrees in chemical engineering	24%	27%	36%	31%

According to the institution it is doubtful whether it is justifiable to retain at college for chemical engineering research such a high proportion of first degree men as the estimates for 1959 and 1966 given in Table 2 indicate. In 1953 about 22 per cent of the institution's members were employed on research and development.

Deferment of engineering graduates with second class honours who have also taken a higher degree, and who completed a course of study or training in 1956 should help, the survey considers, to lighten the burden of recruiting not only teachers of chemical engineering, but also research students.

1957 was Record Year for ICI Sales, says Development Director

SPEAKING at a foremen's dinner of the ICI heavy organic chemical division held recently at Billingham-on-Tees, Mr. C. M. Wright, ICI development director, said that he did not know what the company's final sales figures for 1957 were but he was certain that sales would have been higher than ever before.

He hoped the profit would be a reasonable one. He expressed uneasiness about prospects for 1958, saying there were signs of recession in some industries.

The credit squeeze was affecting the company, but since it took two to three years to put up a factory or extend a works, ICI policy was to go ahead whenever it was thought to be the right course and not to restrict the productive effort.

One of ICI's worries, according to Mr. Wright, was that sales of ICI products were not increasing quite in line with the amount of new capital put in each year (£40 million to £50 million a year on new plant for new products or the expansion of old products). The reason for this was increasing competition not only from Germans, Americans and Japanese, but also from countries 'who are getting more nationalistic.'

ICI however had a 'very great number of eggs in its basket' and even if there was some recession in some industries it didn't necessarily have a 'catastrophic effect on ICI as a whole.' Mr. Wright referred to the 'very wide and expanding field' of the heavy organic chemicals division and to its proposed new headquarters at Wilton. After correction of figures to allow for changed values, Billingham's sales had increased by almost three times since 1946.

The changing pattern of the company's organisation was also noted by the speaker. 'This pattern was now changing, Mr. Wright said, 'in favour of composite sites, such as Wilton,' because divisions were getting nearer and nearer in the type of products they made with some taking raw materials made by others and because very considerable sums of money were saved in transport and services when several divisions operated on one site.

The Severn-side site was to be developed in 'the same way as Wilton.' The main reason for going there was that a large part of ICI's customers were in the South of England. Production in the South would cut transport costs and help with the overall costs of the company's products. Other reasons for the Severn-side site were that in the future, the chemical industry would be based much more on oil than coal, and it was important therefore, to be near a port which large tankers could use.

Sodium Chlorate Shipment Led to Cotton Fire

The Forensic Science Laboratory at Preston has established that the explosive powder which set fire to bales of cotton after they came in contact with a wall at a Liverpool warehouse on 11 March was sodium chlorate. The cotton bales brought to Liverpool in the German steamer Norderau from Hamburg were stored in a hold in which were also canisters of sodium chlorate and sodium chloride. When the sodium chlorate was unshipped at Manchester, before the ship unloaded the cotton at Liverpool, there were no traces that any of the canisters had been broached or were leaking.

NITRIC ACID MANUFACTURE IN THEORY AND PRACTICE

THREE different types of nitric acid plants were described by Dr. D. A. Spratt of Imperial Chemical Industries, Billingham division, when he gave a paper entitled 'An outline of the theory and practice of nitric acid manufacture' to a meeting of the Fertiliser Society in London on 25 March. The types of plant discussed were the atmospheric pressure plant, the high pressure plant and the combined type of plant.

The advantage of the atmospheric plant was that it oxidised ammonia to nitric oxide very efficiently. The disadvantage was that the maximum economic strength of acid was only about 50 per cent and the absorption system especially had a high capital cost. This could be considerably reduced if it could be combined, as at Billingham, with an alkaline absorption system.

Disadvantages of the high (8 atmospheres) pressure plant were its low oxidation efficiency and high catalyst loss. Advantages of this plant lay in the high absorption efficiency, the production of 60 per cent acid and in low capital investment, for in spite of the fact that expensive compressors and other equipment had to be provided, the small sizes of the burner, the heat recovery section and the absorption tower enabled considerable capital savings to be made.

Low Chemical Efficiency

However, the disadvantage of the high pressure plant, that is the low chemical efficiency and the ammonia oxidation, could be overcome, said Dr. Spratt, if the oxidation was carried out at atmospheric pressure, and the nitrous gas then compressed for absorption, thus obtaining the maximum chemical efficiency of both stages. Plant embodying this principle had been successfully developed. The chemical efficiency was very high but the designer of such a plant faced certain problems not met with in the more conventional plants as mentioned above.

A fundamental disadvantage was that heat of compression of the gases enters the system at a point where removal of heat was necessary, i.e. before the absorption stage as distinct from other plants where heat of compression was supplied just where it was needed (before the ammonia oxidation stage). Another practical difficulty was that the compressor had to be absolutely gas tight.

Dr. Spratt gave the following quantitative comparison of the three nitric acid plants:

	Atmospheric pressure	High (8 ats.) pressure	Combined type
Capital	Highest	Lowest	Intermediate
Burner efficiency	96–98	94–96	96–98
Catalyst loss * rate/ton HNO_3	1	3–4	1
Strength of acid produced	50–53%	60%	60%

*Comparative figures only

Capital expenditure fell progressively as the working pressure increased, said the lecturer. The higher the working pressure the greater was the cost of raw materials per ton of nitric acid, as the catalyst loss rate increased with pressure and the ammonia, the cost of which dominated the final nitric acid cost, was oxidised at an efficiency which decreased as pressure rose.

Heat recovery in a low pressure plant was generally better than in a high pressure plant, although this was partly offset by recovery of heat energy and also by the possibility of recovering the heat of oxidation of nitric acid to nitrogen dioxide.

The combined type of plant was intermediate between high and low pressure plants in capital requirements; capital is minimised on the small absorption section, but the gas preparation, burner and heat recovery sections are large, and the compressor for the nitrous gas is naturally rather more elaborate than an air compressor. Raw material costs were lower than for a high pressure plant due to the high efficiency and low catalyst loss of the burner. Maintenance costs might be higher for a pressure plant since the nitrous gas compressor requires a high standard of maintenance.

The choice of a plant for any particular factory was finally determined by local economic circumstances and factors such as cost of stainless steel and of ammonia, whether there was a market for by-products, power costs, etc. Dr. Spratt quoted as an example a recent task of designing the most economic nitric acid plant for a north of England factory. The requirements were that there should be no by-product salts and the acid should be of 60 per cent strength. Committed to a pressure absorption plant, it was calculated that the most economic pressure for this plant was three atmospheres.

At three atmospheres pressure it was considered that it should be possible to burn ammonia at high efficiency and with reasonable low catalyst loss. High chemical efficiency was required and efficient heat and power recovery systems were provided.

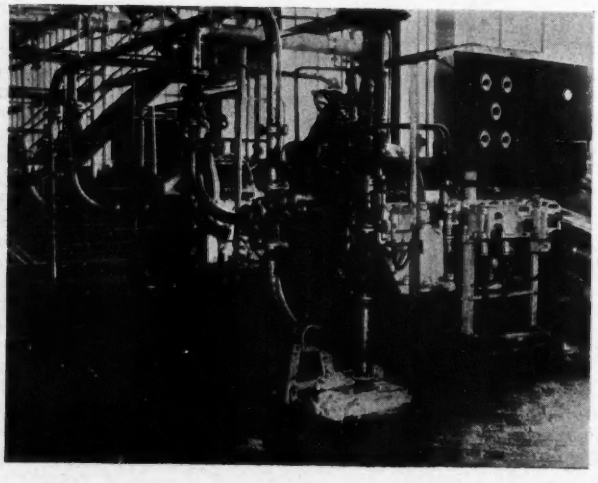
In this plant ammonia is vaporised at three atmospheres in a heater which is warmed by the acid from the cooler condenser. The ammonia gas is passed through a preheater, which prevents carryover of droplets, and through a filter to remove oil. Air, filtered from atmospheric dust is compressed to three atmospheres, giving it a temperature of about 180 °C and thus obviating the necessity for more preheating. The air and ammonia are mixed in a vessel containing specially designed baffles and again filtered to remove scale originating from the plant and other dust before the gases enter the burner. This single burner has a relatively large diameter, and the problem of supporting the large gauge has been overcome, said Dr. Spratt, by supporting it on the top tube plate of a fire-tube boiler.

After reacting on the catalyst the gases are cooled to about 250 °C in the boiler. Secondary air is then admitted to the cooled gases, and they pass to an empty chamber where the reaction $2NO+O_2 \rightarrow 2NO_2$ proceeds at a speed sufficient to raise the gas temperature by about 100 °C.

The heat of this reaction is utilised by passing the gases through the exhaust gas reheater and the economiser, a preheater for the boiler feed water. Temperature of the gas is still above the condensation point, and gas passes to the cooler condenser, emerging from this at 40 °C after depositing an acid of some 30 per cent strength. Acid from the cooler-condenser is cooled and bled off from the circulating system to the correct plate of the absorption tower. This tower and the bleacher are stated to be quite conventional, except that the tower is fitted with sealed sieve plates instead of bubble cap plates.

These sieve plates, stated Dr. Spratt, have been found to be about twice as efficient as bubble-cap plates in absorbing nitrous gas and in addition their construction was such as to make possible a neat arrangement of the cooling tubes across the plates.

Hydrators for Crystal Separation



Part of the installation at ICI, Wilton, Yorkshire, of C 27 Super-D-Hydrators supplied by Sharples Centrifuges Ltd. Eleven hydrators have been installed on crystal separation, and at other stages hydrators are processing slurries at sub-zero temperatures. They are all operating continuously by automatic control by means of time cycle controllers.

ONE-DAY SYMPOSIUM ON EDUCATION IN POLAROGRAPHY

Three-Part Czech Film Shown

FIRST showing in the UK of a film on polarography took place at the Birmingham College of Technology on 20 March. The occasion was a one-day symposium on 'Education in Polarography' organised by the Polarographic Society.

Papers were presented at the symposium by G. F. Reynolds, chemical inspectorate, Ministry of Supply, D. Price, Imperial Chemical Industries Ltd., metals division, W. J. Parker, British Polarographic Research Institute, and Dr. J. Masek, Czechoslovak Polarographic Research Institute, who also introduced the showing of the film.

Made under the supervision of Professor Heyrovsky in Czechoslovakia, the film is in three parts, (1) Introduction and charging currents, (2) Diffusion processes, and (3) Special polarographic processes. It is intended as an introduction to the subject for final year students and post-graduate workers in industry.

The film will remain in the UK for six months during which time it will be available from the Polarographic Society. Those interested in showing it should contact Mr. D. R. Curry, 28 St. Mary's Way, Baldock, Herts.

Teaching Polarography

'MY subject is 'Teaching polarography' and not teaching how to use a polarograph,' said Mr. G. F. Reynolds, presenting the first paper at the symposium. Practical instruction was important, he said, but the methods could be taught to any intelligent assistant.

Electrochemistry could conveniently be divided into three sections: (1) Electrogravimetric or electrographic methods, (2) electromeric methods in which one or more electrical quantities were measured and correlated with the concentration or total quantity of the substance being determined, and (3) high frequency methods.

Polarography belonged to the second group since it was essentially a method of microelectrolysis employing special conditions and special electrodes in which current, and to a certain extent potential, were measured and used for qualitative and quantitative determination.

This allowed the dropping mercury electrode to be introduced to the student as a specialised electrode at which oxidations and reductions, with or without deposition, could take place, but not as a device which was outside the usual bounds of electrochemical theory.

The fundamental current involved in polarography was the diffusion current and the significance of this in relation to other currents present in the cell had to be grasped.

After the basic introduction it was possible to explain to the student that things were not quite so straightforward because the process was complicated by the presence of other currents in the cell.

It should be explained that the theory developed could apply to the reduction or oxidation of any inorganic species that would react within the suitable range of potential.

This approach to the teaching of polarography was the correct one, Mr. Reynolds believed, because the theoretical basis of the subject could be grafted onto the basic principles. The theory was necessary for the fully trained polarographer but it should come second.

Three Reasons for Intensified Effort

THERE were three good reasons to justify a more intensive educational policy in polarography, said Mr. D. Price, who took as his subject 'Industrial aspects'. They were:

(1) The present-day trends towards instrumental methods of analysis, which have gained impetus recently due to the shortage of scientists.

(2) Improvements in design and supply of commercial polarographs.

(3) An enormous increase in the number of literature references to polarographic methods, many dealing with specific industrial applications.

It was doubtful if polarography was being used in industry to anything like its full extent, said Mr. Price. Almost all laboratories possessed a spectrophotometer but nothing like the same number possessed a polarograph.

The reason for the popularity of absorptiometry might not be hard to find. For many years the analyst had to complete colorimetric determinations by visual comparisons so that the introduction of an instrument which speeded up the process and avoided errors was welcomed. Polarography did not have the same 'tailor-made' introduction and an industrial analyst had to be convinced of its advantages before he would consider purchasing an instrument.

It was therefore apparent that chemists in charge of industrial laboratories should be made aware of the potentialities of this comparatively new technique.

Once the use of polarography was established, training of personnel at all educational levels from GCE upwards was necessary. Even at graduate level industry could not expect to recruit ready trained polarographers, and junior personnel were hardly likely to have heard of the subject. Training therefore had to come from within industry itself.

Mr. Price outlined a broad pattern of training. It should consist of a moderate amount of introductory reading followed by practical instruction on a polarograph. At ICI they had found an oscilloscopic polarograph useful in this connection.

Earlier Unpublicised Work Being Studied

THE introductory theme in educational courses in polarography was generally of the contemporary pattern, consisting of a series of observations during electrolysis leading up to the establishment of concentration polarisation, said Mr. W. J. Parker. An alternative approach consisting of the historical development of polarography, however, provided a useful framework on which to build the theory and practice, and permitted the logical development of the subject from the studies of electrocapillarity by Professor J. Heyrovsky in 1913.

As a supplementary course to the contemporary approach, an acquaintance with the historical development of polarography might enable students to gain some familiarity with investigational techniques and the nature of the problems awaiting solution.

The recorded history of polarography, he said, had many gaps, however, and to fill these gaps in our knowledge much of the earlier unpublicised work was being investigated and the salient discoveries recorded.

The electrocapillarity studies of Professor Heyrovsky were carried out at University College, London, and led to the study of dilute amalgams and capillary electrodes, leading in 1921 to the simultaneous measurement of current-voltage curves.

A secondary maximum in the electrocapillary parabola encountered by Professor Kucera at Prague University in 1918 also stimulated the studies resulting in the development of the first recording polarograph by Professor J. Heyrovsky and M. Shikata in 1925.

A review of the work of the recently formed British Polarographic Research Institute was presented by Mr. Parker. He noted that the development of practical training facilities was primarily due in the UK to the lead given by the polarograph manufacturers.

Theory Ahead of Practice, says Masek

POLAROGRAPHY had reached a stage where theory was ahead of practice, said Dr. J. Masek. In almost every branch of science and technology connected with chemistry examples could be found where the application of polarography would be of advantage but this method was not applied. This was partly due to the lack of polarographs.

However, said Dr. Masek, many cases were encountered where a polarograph was available but was never used and in many cases had never been taken out of its box.

'To improve this state of affairs means to improve general education in polarography.'

The main problem, said Dr. Masek, was to enlarge the knowledge of beginners. He described the course introduced at Charles University, Prague, by Professor Jaroslav Heyrovsky 25 years ago.

Students attended lectures by Professor Heyrovsky, together with a practical course in which they learnt to handle polarographs and got acquainted with polarographic methods.

Although the type of training carried out at Charles University was satisfactory, said Dr. Masek, the number who could attend was necessarily limited. At the Polarographic Research Institute they were trying to improve this situation in two ways. Firstly they tried to help everybody who asked them for advice and in addition several external workers, mainly from abroad, were working at the institute.

Secondly they had made a film explaining the basic principles of polarographic theory.

Introducing this film, Dr. Masek said that it was intended for a beginner. It would be impossible for the beginner to understand everything in the film at the first showing but it would give him a rough idea of the subject.

The film alone could not teach anybody polarography. It could, however, claimed Dr. Masek, be a considerable help for the beginner. It possessed the following advantages over study from a textbook (1) No textbook could give the reader a survey of the whole field in such a short time, (2) the phenomena are learnt visually, enabling an easier understanding and remembering of the subject, and (3) the film enabled the student to distinguish between important and less important details.

Symposium on Project Organisation

THE ORGANISATION of chemical engineering projects will be the subject of a symposium to be held jointly by the Institution of Chemical Engineers and the Institute of Petroleum from 24 to 26 June during the Chemical and Petroleum Engineering Exhibition at the Olympia, London.

The symposium will be presented in seven parts: (a) design data and specification of requirement, including site selection; (b) system of project organisation; (c) functions of the contractor; (d) programming and progressing systems and meeting completion dates; (e) cost estimating and control; (f) plant commissioning; (g) analysis and future use of project records.

In most cases two papers will be given on each of these parts. Except in the case of (c) one of the papers in each part will be given by a member of a chemical producing firm and the other by a member of a contracting firm. The manufacturing firms concerned are Albright and Wilson, British Petroleum, Distillers Co., ICI, and Shell Chemical. The contracting firms are APV, E. B. Badger and Sons, W. J. Fraser and Co., Power-Gas, Simon Carves, George Wimpey and Woodall-Duckham.

Preprints of all papers will be circulated free to registered symposium members to allow as much time as possible to be devoted to questions and discussion. The registration fee for members of the organising bodies and of constituent bodies of the European Federation of Chemical Engineering is £2. The fee for others will be £3.

Enquiries about the symposium should be sent to the general secretary, Institution of Chemical Engineers, 16 Belgrave Square, London SW1.

South West Gas from Oil Project

PLANS to build a plant in the South Western Gas Board Area which would produce gas by hydrogenation of oil have been outlined by the Board's chairman, Mr. C. H. Chester. At an area Gas Consultative Council meeting at Taunton recently, Mr. Chester said the process, developed in the Gas Council's laboratories, was 'an evolution almost standing equal with nuclear energy.' He forecast that it would produce gas at almost one-third of the present cost.

A research development programme for producing gas by this method in the South-West has been approved by the area Board, the Gas Council and the Ministry of Power. Mr. Chester has set up a team of four experts from the area Board to work in conjunction with the Gas Council's Midland Research Station at Solihull. It is expected to be three years before the Board would obtain results. The design of the plant was in hand. It will possibly be installed at Bristol, Gloucester, or Plymouth.

There were great possibilities, said Mr. Chester, in the process of producing gas of normal combustion characteristics but low in carbon monoxide and free from sulphur. The process would also create a number of valuable by-products, particularly for the nylon, Terylene and plastics industry. 'It is a pioneering project which I am confident will eventually revolutionise the productive aspect of the gas industry.'

New Berk Booklet on EDTA Chelating Agents

Chelating agents based on diaminoethane tetra acetic acid (EDTA) are the subject of a new booklet by F. W. Berk and Co. Ltd., Berk House, Portman Square, London W1, who offer these products in their Detarex range. The booklet gives a concise survey of the nature and applications of the agents. More detailed information is available on application to the company over a wide range of subjects from textiles to pharmaceuticals.

No Limit to UK Plastics Industry's Expansion

GIVEN reasonable trade conditions, there is no limiting target yet in sight for the expansion of the UK plastics industry, said Mr. H. V. Potter (Bakelite Ltd.), president, at the annual meeting of the British Plastics Federation in London on 19 March. New materials and new uses for existing materials were continually being developed.

Output last year was estimated at 400,000 tons, worth about £110 million, and an increase of nearly 20 per cent on the figures for 1956. Exports of raw materials in 1957, 112,000 tons worth nearly £30 million, represented an increase in value of nearly 15 per cent over 1956.

The increases had been accomplished by more capital investment and by an increased number employed, but in spite of that, costs had continued to rise, said Mr. Potter. In many cases these had had to be absorbed, due to fierce competition both at home and abroad. Any further increase in costs must be absorbed by increased efficiency, increased production and sales. The industry must try and stabilise prices as far as possible.

Superior Properties of New Dunlop Synthetic Foam

As a result of extensive research and development work in the UK and US, Dunlop scientists have produced a new type of synthetic foam claimed to be the most rubber-like so far developed.

The new product, which will be complementary to Dunlopillo latex foam and the company's existing synthetic foam known as Dunloprene, is mainly derived from polyethers and diisocyanates, raw materials obtainable from the petroleum and coal tar industries. In addition to having a pleasant appearance, it has the soft springy feel associated with rubber and its resistance to chemicals and to ageing and weathering are likely to prove fundamentally superior. Its physical properties represent a considerable advance over those of Dunloprene on account of the more chemically stable polyether component and the closer control that can be exercised over the prepolymer manufacture.

It is expected that this new foam, which is now undergoing exhaustive tests at the Dunlop factory at Walton, Liverpool, will have many applications, particularly in the upholstery trade, where it will be introduced within the next few weeks. One of its most important characteristics for the aircraft and transport industries is that weight for weight it will support a greater load than latex foam.

Lurgi Gasification Plant

Owing to a typographical error the reference to Britain's first Lurgi high pressure gasification plant in our issue of 8 March, p. 447, read 'low pressure'. The reference: 'Benzole, a valuable by-product, will also be recovered from the crude gas' should not have included added mention of the Benfield process, which is, of course, used for washing out the carbon dioxide.

Overseas News

WEST GERMAN CHEMICAL INDUSTRY TURNOVER INCREASED BY 13.6 PER CENT

TURNOVER of the West German chemical industry for 1957 increased by 13.6 per cent to DM17,500 million, compared with DM15,400 million for 1956. The number of workers employed by the industry increased by about 22,000 to 418,000 in the year.

Prices remained stable, increasing by about 1 per cent. Production expanded by about 11 per cent, more than twice the rate for West German industry as a whole. The expansion is primarily attributed to the growth in the output of new chemicals, especially plastics, and to the discovery of new uses for existing products.

In 1957 about 26 per cent of total production was exported, Export turnover is expected to reach about DM4,500 million, 15 per cent more than 1956. By the end of the year, however, the rate of increase was beginning to fall away.

As a percentage of total German exports, chemicals in 1957 still accounted for about 12.7 per cent whereas prewar it was as high as 17-18 per cent. Exports to all foreign markets increased during the year with the exception of Australia.

The traditional South American market, despite payment difficulties in certain cases, took German chemical products worth DM235 million—an increase of 27 per cent as compared with the previous year. Exports to the US rose from DM144 million to DM183 million and as a result the US became the third most important individual export market for West German chemical products. Exports to Egypt also improved, mainly as a result of increased sales of nitrogenous fertilisers, and rose from DM111 million in 1956 to DM161 million.

Imports of chemicals and chemical products into Germany, on the other hand, increased in value from DM1,340 million to DM1,600 million. About 20 per cent of total imports consisted of raw materials and the remainder of intermediates and finished products. Imports of pharmaceuticals increased by more than 60 per cent. The industry attributed the growth in imports to the Federal Government's liberal trade policies and to the reduction of customs duties. (DM 11.75=£1.)

Swedish Chlorine Capacity

Swedish output capacity for chlorine is now about 150,000 tons a year from six factories according to the managing director of AB Svenska Klorfabrikanter.

β-carotene by Fermentation

A fermentation process for the production of beta-carotene (a source of vitamin A) has been developed by US Department of Agriculture scientists at the Northern Utilisation Research and Development Division, Peoria, Illinois.

Mould fungi of the Choanephoraceae family have been found to grow in solutions of ground corn and other cereals in aerated fermenters and to create deposits of beta-carotene in the fungus cells. Recently, researchers at the West Virginia Agricultural Experiment Station discovered that mating of strains of the mould *Choanephora cucurbitarum* increases the yield of fermentation products. Subsequently scientists at the Peoria laboratory worked with *C. cucurbitarum* and related species and obtained a four-fold to five-fold increase in carotene yield by using two mated strains of the moulds, and further large increases by improving the culture medium.

Carotene that is stored in the fungus cells can be concentrated for filtration. The resulting product is a bright-orange filter cake or mat of solids containing up to 0.5 per cent beta-carotene. It may be ground for use in feeds or processed to obtain pure beta-carotene. Assays have shown that beta-carotene produced in this way is biologically available.

Russia's Dimethyl Phthalate Plant

Frederick Krupp are to begin construction in Russia of a plant for the manufacture of dimethyl terephthalate. The German Imhausen process will be employed. The product will form the basis for the plastics industry and will permit manufacture of fibres of the Terylene type. The cost of installation will be of the order of DM 17 million.

Israel Plant to Produce Sulphuric Acid

The sulphuric acid plant of the Timna copper works in Israel is expected to begin commercial production in about six months' time. The plant will have a daily output of up to 90 tons to be used by the nearby copper works. At present, sulphuric acid is produced from sulphur imported from Mexico and the possibility of using sulphur from African mines is at present under investigation.

Hoechst DM 100 Million Loan

A banking consortium headed by Dresdner Bank is to launch a DM100 million 7 per cent industrial loan of Farbwerke Hoechst on 26 March at 98 per cent.

20% Increase in Dutch Chemical Industry Turnover

The Association of Netherlands Chemical Industry states in its 1956 report that turnover totalled Fl2,200 million, against Fl.2,000 million in 1955. Exports totalled Fl.1,026 million compared with Fl.919 million in 1955. Volume of exports in the year under review totalled (in 1,000 tons) 2,334, of which 1,553 were distributed in European countries, 334 in Asia, 296 in America, 133 in Africa, and 18 in Oceania. The distribution of exports according to value (in million florins) was as follows: Europe, 607; Asia, 178; America, 147; Africa, 63; and Oceania, 31. Nearly one-half of the total turnover was exported in recent years. In 1956, exports of chemical products represented about 9.5 per cent of the country's total exports.

The Netherlands Central Bureau of Statistics has released export figures for 1957, which show that shipments of chemical products were valued at 1,000 million guilders, compared with 821.7 million guilders in 1956.

China to Produce Synthetic Rubber and Fibres

Red China is shortly to begin manufacture of synthetic rubber. It has been announced that a factory for this rubber and for caustic soda is actually in construction at Changshou on the upper part of the Yangtse river. The power required for the factory will be furnished by a hydro-electric station on the River Lungki, which is in the vicinity.

Near Pekin, the first Chinese factory to produce synthetic fibres has been built. It was finished at the end of last year and is to produce 300 tons of nylon thread. A synthetic rubber plant has also been planned for this area.

Chile to Continue Fertiliser Import

Replying to a request from the Chilean Chamber of Deputies for details as to why the free import of phosphate fertilisers had been permitted, the Chilean Minister of Agriculture said that the measure had been taken because of the importance of phosphate fertilisers in improving agricultural production, the high price and shortage of fertilisers produced within Chile, and the fact that the imported product had almost double the fertilising power of domestically produced phosphates. The Minister added that so long as the Chilean industry was unable to improve its efficiency, it would be necessary to import the raw materials and to manufacture phosphate fertiliser for direct use by farmers.

Metals Recovery Aided By Micro-Organisms

Micro-organisms similar to those that cause illness and also provide antibiotics for combating disease are now being studied by scientists of the US Bureau of Mines as potential aids in recovering valuable metals from low-grade ores, for producing synthetic liquid fuels from oil shale, and for studying the structure of coal, according to Dr. Walter N. Ezekiel, Bureau microbiologist. Pioneering work in microbial research already has been started on a small scale at four of the Bureau's laboratories.

Promising recoveries of copper, nickel, cobalt, and other metals have been obtained at the Bureau's Eastern Experiment Station in College Park, Maryland, by the action of bacteria mixed with small samples of low-grade ores. These bacteria, which oxidise sulphur to acid, have enabled Bureau researchers to obtain many times the metal recovered in control experiments without bacteria. Meanwhile at Boulder City, Nevada, other laboratory experiments

using bacterial cultures have resulted in extraction of up to 99 per cent of the manganese in some ores.

Although the work thus far is only on a laboratory scale, Bureau researchers feel that it does justify hope that micro-organisms may find commercial application in helping man utilise mineral deposits.

These studies, however, are not limited to the field of metallurgy. Experiments at Laramie, Wyoming, are aimed specifically at finding out whether organisms can be used to recover hydrocarbons from oil shale, instead of the high-temperature retorting now required. Concurrently, research at the Bureau's Bruceton, Pennsylvania, research station is furnishing information on the bacteria, yeasts, moulds, and other minute life forms in coals, and on the biochemical action of bacteria on chemicals like those found in coal.

Large Fertiliser Plant Planned for Trinidad

A $19 million fertiliser plant is to be erected in Trinidad by a subsidiary of W. R. Grace and Co., of the US. Announcing this, Barclays Bank DCO says that the company has been granted certain privileges by the Legislative Council.

The two principal products will be ammonium sulphate and urea. Grace and Co. have also approached the Government on another project which will entail expenditure of some $30 million.

Swedish Chemical Firm Moves

The Swedish firm of Berol AB, Gothenburg, manufacturers of detergents and chemicals for the textile industry, are moving from Molndal to a four-square-miles site at the ice-free port of Stenungsund, 25 miles north of Gothenburg. Mo and Domsjo AB, of which Berol AB is a subsidiary, are transferring their production of emulsifiers and glycols from Ornskoldsvik to the new site.

Italian Sulphur in 1957

Despite a ban on the imports of sulphur and various other measures, production of sulphur in Italy during 1957 remained at about the same level as in the previous year. Stocks in hand were reduced by 26.4 per cent and there was an increase of 23 per cent in exports.

Bitumen Plant in Port of Gela

The Italian company of Agip Mineraria are building at Port of Gela a plant for the extraction of bitumen from crude oil yielded by wells drilled in the concession which they hold three miles away. The plant will be ready to operate in July this year

U S Firms Sponsor Research on Rare Earths

Seven of the principal US producers of rare earths are jointly sponsoring research at Battelle Memorial Institute aimed at finding new uses for these elements. In the two-year study, which began recently at the Columbus, Ohio, research centre, new uses will be sought for individual elements in the rare earth category, as well as new uses involving combinations of these elements. The 15 rare earths include elements numbered 57 to 71 on the periodic table. The group contains such elements as lanthanum, cerium and europium.

New Chelating Agent Announced by Dow

A new chelating agent, Versenex 80, has been introduced in commercial quantities by the Dow Chemical Co., Midland, Michigan US, for the control of iron ions. Versenex 80 differs from other Versene products in that it is based on ethylenediamine.

Anglo-Czechoslovak Trade

New quota lists for Anglo-Czechoslovak trade in 1958 have now been established under the Trade Arrangement signed in 22 October 1956. These will replace provisional lists established for the three months' period ending 31 March, and import licences issued against the provisional quotas will be debited against the quotas now agreed for the full year. There is an increased quota for chemical plant.

Uranium Factory Proposed for Portugal

The president of the Nuclear Energy Board of Portugal has announced that his board has proposed the inclusion in the Second Six-Year Development Plan of a factory for the production of metallic uranium in the centre of the country, with an annual capacity of 100/150 tons. Cost of this factory is expected to be about £3 million.

OTS Issues Handbook of Radiochemical Analysis

A handbook containing information necessary for precise radiochemical analysis of fission and non-fission product activities has recently been made available for industry use through the Office of Technical Services, US Department of Commerce.

The handbook was prepared under US Government contract by Tracerlab Inc., with the co-operation of the Los Alamos scientific laboratory chemistry group. It appears in two volumes under the general title 'Handbook of Radiochemical Analysis.' They are:

Volume 1: *Radiochemical Techniques.* 152 pages. (Order PB 121690 from OTS, US Department of Commerce, Washington 25, DC, $4.) A prerequisite for the use of the second volume, particularly for those unfamiliar with radiochemical analysis, this book contains information and instructional material for the procedures. Tables, drawings of equipment, and various curves useful in treatment of counting data and identification of functions influencing counting rate determinations are also included.

Volume 2: *Radiochemical Procedures.* 129 pages. (Order PB 121689). This volume clarifies the chemistry and standardises the techniques used in analysing fission product and non-fission product isotopes. Three main chemical tasks are involved: dissolution of the sample with steps to provide for the exchange between active isotopes and added carrier elements; separation of the individual activities from the solution; and decontamination and determination of the desired activities. Samples considered are of antimony, barium, cadmium, cerium, caesium, europium, lead, molybdenum, neptunium, plutonium, ruthenium, silver, strontium, tin, uranium, and zirconium.

Hungarian Gallium Extraction

The Hungarian Institute of Research on Metals has developed a process for the recovery of gallium from lye washings used for the transformation of bauxite into alumina. It is claimed that it is possible to extract theoretically 1 kilogramme of gallium by the treatment of 10 cubic metres of washings. The process has been developed in the laboratory and will now be tried on an industrial scale.

Irish Testing Laboratories

The Institute for Industrial Research, Dublin, is to build three testing laboratories at Glasnevin, Dublin, at a cost of £130,000, including equipment. The laboratories will assist industrialists and manufacturers, and preliminary work on site clearance has begun.

Austrian Firm's Output Rose 20 Per Cent

OUTPUT of the Osterreichische Stickstoffwerke in Austria last year totalled 906,300 tons or about 20 per cent more than in 1956 (756,400 tons). Eighty per cent of this output i.e. 724,800 tons consisted of nitrogenous fertilisers. This is 19.6 per cent more than the total produced in 1956 (606,000 tons).

Sales rose from Sch. 900 million (£12.3 million) in 1956 to Sch. 1,100 million (£15 million) in 1957, registering an increase of about 22.2 per cent. About 60 per cent of sales were accounted for by exports.

During 1957, Sch. 114 million (£1.5 million) were invested in the concern bringing the total investments made since 1945, to over 1 milliard Sch. (£13.7 million). Out of the total invested in 1957, 49 per cent was utilised for new plants and the rest for expansion and improvements.

In October 1957, the company started operating a new unit for the production of sulphuric acid. This has increased the potential output of the plants at Linz to 75,000 tons a year.

The potential of superphosphates-producing plants has been increased to over 80,000 tons.

Some time ago, co-operation between the company and the Italian firm Montecatini in the field of petrochemicals was mentioned. It now seems that unexpected difficulties have arisen in this connection and our correspondent says that nothing further has been said in this direction.

MORE NEW DEVELOPMENTS AT PHYSICAL SOCIETY EXHIBITION

SUMMARISED here are more new developments shown at the Physical Society Exhibition held this week at the Royal Horticultural Halls, London. CHEMICAL AGE last week included a nine-page preview of exhibits.

Grating Spectrophotometer

The CF 4 grating spectrophotometer is available from *Optica United Kingdom Ltd.*, Team Valley, Gateshead, in a number of alternative forms. A number of new attachments were also to be shown and these have been designed as integral parts of the instrument.

The range of the instrument extends from 1,850 Å to 10,000 Å, its dispersion is 16 Å/mm. and the resolution is very high. For example, potassium dichromate standards at 2,000 Å can be analysed with a bandwidth of approx. 0.75 Å. The electronics are mounted in a separate cabinet, except for the control amplifier mounted on the back of the instrument. A number of source units are housed in a single lamp housing which slides on indexed guide rods mounted outside the instrument.

Attachments include a spectro-fluorimeter that is suitable for solutions or for surfaces. A Compur shutter for time exposures is fitted. The flame photometer head slides into the place of the lamp housing. Two burners are provided. The attachment can be used in conjunction with the double-beam recording instrument for plotting flame spectra. In view of the fact that this indicates background, interfering lines as also photometric maxima, flame analysis with the aid of this attachment is simple and precise. The burners are of special design and enable a high degree of sensitivity to be achieved.

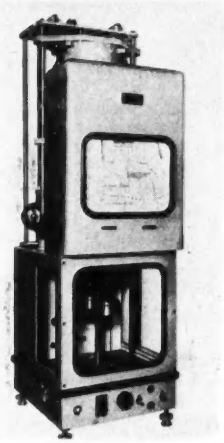
Reflectance attachment is intended for colour and whiteness measurements in accordance with CIE recommendations. It replaces the normal single-beam head. The total light reflection attachment of the double-beam type employs a light collecting sphere and is intended for industrial colour measurement. The sample is illuminated by one beam, the magnesium oxide standard by the other.

Fully Compensated Thermo-Recording Balance

A selection from their range of precision balances were shown by *Stanton Instruments Ltd.*, 119 Oxford Street, London W1. These include free swinging and aperiodic balances with partial and full weight loading, single pan models and thermo-recording balances.

Apart from the standard thermo balance, which consists of balance model A 42 or A 44 surmounted by a furnace and fitted with twin-pen electronic recorder, a fully compensated model was demonstrated. This instrument is fitted with dual furnaces which are controlled by a completely new stepless controller claimed to give various straight line heating rates.

Greater output can be obtained from a single balance and the blank can be run at the same time as the sample. The continuous change in weight curve obtained is thus continously compensated for buoyancy and is recorded adjacent to the continuous record of temperature relating to the sample furnace. The temperature of the second furnace is now indicated separately at the controller enabling full use to be made of the decimilligramme sensitivity of the balance.



New Stanton thermo - recording balance.

Manipulation of Micro-chemical Amounts

Handling of small quantities of materials in microchemical work can be carried out by the micromanipulators shown by *Singer Instrument Co. Ltd.*, 83 London Street, Reading.

The microdissector (low power micromanipulator) is claimed to be suitable for use under magnifications of from 1 to 200. All movements are obtained by means of a single control handle shaped and held like a pencil. All dissecting and manipulating tools of any shape from fine needles up to 8 mm. diameter can be accommodated in the instrument holder.

Small quantities of radioactive materials can be handled by the Singer micromanipulator. This is of robust construction and is operated by joystick control for two-dimensional movement in a horizontal plane. Vertical movement is obtained by rotation of the control.

Transistorised Servo System

Three exhibits which the company thinks will be of interest to chemical engineers were shown by *Texas Instruments Ltd.*, Dallas Road, Bedford. They were a transistorised servo system, a transistorised amplifier driving a torque motor and a transistorised d.c. converter.

The servo equipment is a remote control system whose input is derived from a synchro generator. The output drives a 9 watt motor and there is sufficient power available to drive a 15 watt motor if necessary. Applications in the remote control of chemical plant are suggested by the company.

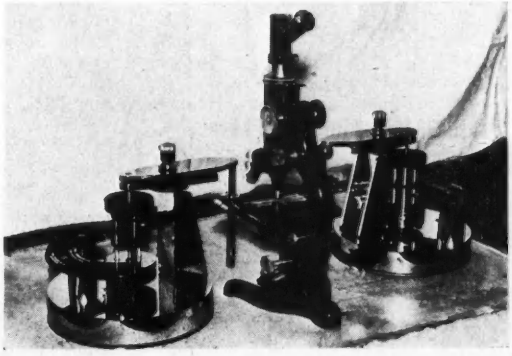
Of application where hydraulic valve control is required or for adaption for use with pen recorder systems is the torque motor amplifier which uses the 2S017 medium power silicon transistors. A differential amplifier is arranged to drive the two coils of a 4 watt motor. The input to the amplifier is a low frequency signal whose frequency and amplitude can be varied, and the output of the torque motor follows the applied signal.

The d.c. converter uses two 2S012 silicon transistors to provide 250 volt high tension supply from a 24 volt battery. Efficiency is claimed to be about 75 per cent with an available power output of 14 watts.

New High Purity Fused Silicon by Thermal Syndicate

Most important exhibit on the stand of *The Thermal Syndicate Ltd.*, PO Box 6, Wallsend, Northumberland, was a completely new type of fused silica. Known as synthetic fused silica, it is made from pure silicon compounds instead of from quartz crystal and is claimed to have a total impurity content of less than one part in a million.

This material has been developed primarily for the semiconductor industry and samples of crucibles, etc., will be shown. Because of its extreme purity it has much better optical characteristics than previous grades of fused silica, transmitting down to 1650 and having greatly increased homogeneity. It is also relatively free from the colouring effects normally produced in glasses by atomic radiations and examples of this material



Singer micro-manipulator

in its optical form together with information on its properties will be shown.

It has been found that immersion heaters with fused silica sheaths are not suitable for use in strong alkaline solutions or in hydrofluoric acid. The company has developed two new types of sheath for use with these chemicals: an aluminous porcelain sheath for use with caustic solutions and a recrystallised alumina sheath for use with hydrofluoric acid solutions. Lengthy tests are required before performance of these new sheaths can be guaranteed but present tests show that they will have a useful life.

Comment is invited by the company from catalyst users as to the degree of porosity desirable in a porous refactory material to give a large surface area. Samples of an exploratory nature were on show.

Thermal Conductivity of Insulating Material

H. Tinsley and Co. Ltd., Werndee Hall, South Norwood, London SE25, had on display the DSIR probe type 5317 which has been developed for *in situ* measurement of the thermal conductivity of insulating materials. It consists of a hypodermic tube fitted with an axial heater wire and thermocouple. The rate of increase of the thermocouple e.m.f. is directly proportional to the thermal conductivity of the material under test.

A similar but larger instrument has been developed by the Electrical Research Association for measuring the properties of soils in the vicinity of buried pipes. This instrument is in production by the company.

New Tintometer will Handle Water White Liquids

A new design of the Lovibond Schofield tintometer was exhibited by *The Tintometer Ltd.*, Salisbury. As in all previous models, it is based on the Lovibond subtractive colour scales of glass filters and by means of the nomogram supplied it is claimed that it is possible without any calculation whatever to convert instantly from the values read from the instrument into the x, y, z co-ordinates of the colour system of the Commission Internationale de l'Eclairage.

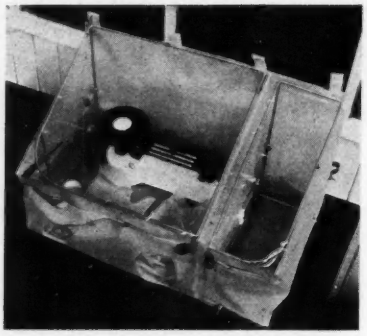
The new model makes it possible for the first time, claim the makers, to deal with water white liquids which have to be viewed in a depth of 18 in. in order to develop sufficient colour to match with certainty. The same instrument can be used for darker liquids in smaller depths and also for surface colours or for the colorimetry of light sources.

Infra-Red Moisture Tester Has New Developments

Townson and Mercer Ltd., Beddington Lane, Croydon, Surrey, claim that they have considerably modified their flexible glove cabinet since it was shown in 1957. It can now be used with either slight positive pressure, using inert gas or dust-free air etc., or by means of an inserted metal framework, it can be held to shape while it is operated with a slight negative pressure.

The working area can be opened by an air-tight zip fastener and there is an air-lock on the side for passing articles in and out. The entire cabinet is made of p.v.c. including the gloves which are welded on to the structure.

A development of the infra-red moisture testing balance originally patented in 1945 will be on show. In the new instrument the weighing pan and torsion



Townson glove box with lid removed.

balance are in a vacuum chamber which can be opened to place the sample in the pan. When the balance indicator shows zero the correct weight of sample has been added. The container is then closed and the vacuum applied at the same time as a powerful infra-red beam. This evaporates off the moisture at a lower temperature than when used in air, giving less errors due to overheating and complete freedom from errors due to convection currents.

Other exhibits included an oven with automatic boost heating, the X 27 Major thermostat bath and a controlled zone conveyor oven.

Cathode Ray Comparator for Spectroscopic Lines

A comparator for accurate measurement of spectroscopic lines by cathode ray tube presentation was shown by the *UK Atomic Energy Authority*, St. Giles Court, London WC2. Light first passes through a photographic plate and then through an octagonal prism blackened on alternate faces which rotates at 25 r.p.s. so that the line is scanned at 100 c/s. The light afterwards falls onto a slit behind which is a photomultiplier feeding the y plates of a cathode ray oscilloscope. The x plates are swept at 50 c/s so that the two line traces are seen except when the line image is exactly on the slit and no light can reach the photomultiplier.

This enables the position of the line to be determined with accuracy and speed and with less eyestrain. The instrument is said to be particularly valuable for dealing with the rare earths and transuranic elements where thousands of lines are involved.

Small changes in gas pressure can be detected by an apparatus in which two identical quartz crystals are connected to separate oscillator circuits. The two crystals are enclosed in a chamber so that they can be kept at the same temperature. One crystal is exposed to the pressure of the chamber while the pressure on the other can be varied from outside.

Continuous monitoring of the pressure in the system is possible in terms of pressure difference. Discrimination should reach one part in 10^6.

The size frequency of dust particles on the order of one micron can be measured in an apparatus in which the particles are spun in a speed and temperature controlled tank. Direct readings of photo-extinction of a light beam passing through the plane of the tank gives the size frequency of the particles.

Equipment for the deposition of nickel by thermal decomposition of nickel carbonyl will be shown. The method, which is only just beginning to be used commercially, will produce coatings with properties comparable to electro-deposited nickel and which can be laid down to any thickness at a much more rapid rate.

Better Resolving Powers in Near Infra-Red

Two new instruments, the SP 100 infra-red spectrometer and the SP 900 flame spectrophotometer, were displayed by *Unicam Instruments Ltd.*, Arbury Works, Cambridge.

A grating accessory, consisting of a second monochromator using two gratings (1,500 and 3,000 lines an inch), is available for use with the rock salt prism of the basic SP 100 to form a double monochromator with high resolution and low stray light, and providing double beam spectra on a linear wavenumber scale over the ranges 650 to 2150 cm^{-1} and 2150 to 3650 cm^{-1}. The accessory incorporates the necessary wavenumber cams and automatic grating interchange mechanism. Arrangements are also made for work outside the double monochromator range.

Development of this type of replica grating is claimed to permit resolving powers to be obtained in the near infra-red which are appreciably better than for conventional prism materials (e.g. LiF, CaF_2 and NaCl).

A.C. Bridge for Use in Macromolecular Determinations

An a.c. bridge (twin-T) of use in investigating the sizes, shapes and molecular weights of macromolecular substances was on show by the department of physics, *University of Southampton*. The components of the bridge have been chosen to enable accurate determination of capacitances to be made.

The bridge input is a continuous wave from a high stability oscillator and the bridge is balanced when there is no p.d. across the detector terminals. This null condition is found by a detector unit consisting of an r.f. amplifier and an oscillograph. Frequency range covered by the bridge is 500 Kc/sec. to 20 Mc/sec. Capacitances of magnitude 1,000 pF at the lower frequencies to 200 pF at 20 Mc/sec. can be measured with an accuracy of 0.1 pF.

PEOPLE in the news

● SIR ALEXANDER FLECK, by a grace passed by the Senate of the University of Dublin, is to receive the honorary degree of Litt.D.

● MR. ERNEST PEDLEY, 42-year-old chemist and barrister, an expert witness at several murder trials, has been appointed director of the North Western Forensic Science Laboratory at Preston, in succession to DR. J. B. FIRTH, who has retired. Mr. Pedley was senior chemist at the Preston laboratory before becoming director of the West Midland Forensic Science Laboratory at Birmingham in 1955.

● DR. ALAN J. HAYTER, of Sharples Centrifuges Ltd., Camberley, has just returned from a visit to Portuguese East Africa. The visit was made in collaboration with S. E. Ginwala Filhos Lda., a prominent local refiner, with the object of determining how the efficiency of cottonseed refining could be increased. Ginwala are now installing a Sharples low-loss refining plant, and when it goes on stream later this year it will be the most advanced and efficient refining plant in Africa.

● DR. P. H. SYKES, a director of the British Oxygen Co. Ltd. has been elected chairman of the low temperature group of the Physical Society.

● MR. L. M. VENANZI has been elected to a joint lectureship in chemistry at Magdalen and Brasenose Colleges, Oxford, with effect from 1 October.

● MR. C. L. BEECH, traffic foreman of British Chrome and Chemicals Ltd., Eaglescliffe, Co. Durham, recently received the British Empire Medal. The presentation was made by LORD LAWSON, Lord Lieutenant of Durham County, in the firm's canteen.

● MR. ERNEST E. STEDMAN, director, and MR. J. F. CLARK, technical representative, both of R. W. Greeff and Co. Ltd., London, recently visited the headquarters of the Dow Chemical Co., Midland, Michigan, for management consultations and technical briefing on new product developments. The visit marked more than 50 years of association between the two companies. R. W. Greeff are Dow's general sales representatives for the UK and Ireland.

● PROFESSOR ARTHUR JOHN BIRCH, professor of organic chemistry in the Victoria University of Manchester, has been elected a fellow of the Royal Society. He has been distinguished for his studies on the structure and biogenesis of natural products. Other new fellows include: P. W. BRIAN, head of the department of microbiology, ICI Akers Research Laboratories (distinguished for his researches on microbiology and plant pathology); R. K. CALLOW, research chemist at the National Institute for Medical Research, London (distinguished for his work on steroid chemistry); W. H. GLANVILLE, C.B., C.B.E., director of the DSIR Road Research Laboratory, Harmondsworth (distinguished for his researches on reinforced concrete and on road construction); H. C. LONGUET-HIGGINS, John Humphrey Plummer professor of theoretical chemistry, Cambridge University (distinguished for his application of mathematics to problems in physical chemistry); R. S. NYHOLM, professor of chemistry, University College (distinguished for his contributions to inorganic chemistry, especially for his studies of complex compounds of the transition elements); B. LYTHGOE, professor of organic chemistry, Leeds University (distinguished for contributions to the chemistry of natural products).

● MR. J. C. HELLIAR, formerly the southern regional representative of Thomas Mercer Ltd., has been appointed sales manager of the company's air gauge division.

Two new representatives, MR. D. G. CARTER and MR. F. M. HARVEY, have also been appointed. Mr. Carter will cover the northern area, the home counties and East Anglia, while Mr. Harvey will serve the southern area of the home counties and South-East England.

● Three young Australian technical graduates who have been awarded scholarships by Imperial Chemical Industries of Australia and New Zealand Ltd. arrived in this country on 19 March. They are to spend two years as salaried employees at ICI factories in this country.

MR. P. R. MITCHELL, a graduate in chemical engineering from Melbourne University, will go to the heavy organic chemicals division on Tees-side, another chemical engineer, MR. B. W. WALSH, goes to dyestuffs division in Manchester, and MR. R. E. CRESWELL, a civil engineer, will go to Billingham division (Tees-side).

● MR. H. F. WILSON, B.Sc., A.R.I.C., and MR. C. L. G. FAIRFIELD, barrister-at-law, have joined the board of the Telegraph Construction and Maintenance Co. Ltd., Theobald's Road, London WC1. Mr. Wilson, who will assume the appointment of managing director of the Telcon Cables Group, was educated at the City of London School and London University where he obtained an honours degree in chemistry. He joined the company in 1919, and was appointed chief chemist in 1945 and technical manager in 1948. Mr. Wilson subsequently headed the company's plastics division when it was re-formed in 1953. In 1956 he was also appointed works manager of the cable factory at Greenwich, and assistant managing director of the Telcon Cables Group in 1957. Mr. Fairfield, who has been appointed commercial director, joined the company in April 1953 as manager of the overseas division, and was soon appointed general sales manager for the company and Submarine Cables Ltd.

● PROFESSOR H. J. EMELÉUS is the President Elect of the Chemical Society for the period 1958-60.

● DR. C. G. ADDINGLEY, director and chief chemist, British Belting and Asbestos Ltd., gave the ninth annual lecture of the Plastics Institute at Leeds University on 13 March. The subject was 'Plastics in conveyor belting, with special reference to the mines'. DR. V. E. YARSLEY, a past-president of the institute, was in the chair.

● MR. H. V. POTTER, Bakelite Ltd., has been re-elected president of the British Plastics Federation for the year 1958-59. Other officers are: chairman, N. B. PUNFIELD (Punfield and Barstow (Mouldings) Ltd.; vice-chairman, D. RADFORD (E. K. Cole Ltd.); hon. treasurer, R. P. ANDERSON (Ebonestos Industries Ltd.).

● MR. M. H. M. ARNOLD, who has been appointed technical director of Bowmans Chemicals Ltd., Widnes (see CHEMICAL AGE, 15 March, p. 510) is honorary editor of the Oil and Colour Chemists Association. Aged 42, he was educated at Repton School and Magdalen College, Oxford. After nine years with ICI he became research manager of BX Plastics Ltd., and from 1947 until taking up his present position was technical manager of Postans Ltd.

M. H. M. Arnold

● MR. GEORGE WAGGETT, manager at the Arrow Mill, Rochdale, of Courtaulds Ltd., who succeeds MR. HAROLD ASHTON, as general manager, was formerly at the company's textile laboratories in Coventry.

● MR. ROGER G. GIBBINS, who has been with Spesco Developments Ltd., Chertsey, Surrey, producers of polythene packaging, has been appointed sales manager, and Miss Fay Barratt has become commercial manager.

● SIR ALEXANDER FLECK, chairman of ICI, will open the Chemical Engineering Department of the Manchester College of Science and Technology in a new £350,000 building in Jackson Street on 19 May. PROFESSOR FRANK MORTON says that in 1956, the department had three teachers, now there are 15.

Commercial News

Higher Profits and Increased Dividend for Albright & Wilson

HIGHER profits for 1957 and an increased dividend are announced by Albright and Wilson Ltd.

Group trading profits before depreciation and tax, rose from £4,416,000 to £4,754,000, and the net balance attributable to the company from £1,203,000 to £1,553,000. The figure for depreciation was £1,847,000 compared with £1,822,000 for 1956.

An increase of 2 per cent to 20 per cent in the total ordinary dividend with a second interim of 15 per cent, against 13 per cent, and a proposed one-for-four free scrip issue are also announced. In 1956, the company's US subsidiary, Oldbury Electro-Chemical, was transferred to Hooker Electro-Chemical in exchange for shares in that company. As Albright and Wilson's interest in Hooker is a trade investment, only dividends received from that company have been included in the consolidated accounts.

Treasury consent has been received for the proposed scrip issued, but the directors state that this does not imply an increase in the total distribution for 1958. The issue will be satisfied by application of part of the share premium account and made to holders registered at 15 May. Present issued ordinary is £4,563,639.

Rate of expansion increased considerably in the second half year. In the first six months, group trading profits fell slightly from £2.29 million to £2.23 million mainly due to the inclusion of dividends as opposed to earnings from the US interest, Oldbury Electro-Chemical. Trading profits in the second half year, however, rose by over 18 per cent. The increase in turnover is the outcome of recent capital expansion, both at home and abroad.

Henry Balfour and Co.

Gas and chemical engineers, Henry Balfour and Co., report a group net profit for the year to 31 October last of £47,739 (£46,880). Outlay contracts take up £22,516 and stocks and works are £443,321 (£346,701), this increase stemming from increased turnover and extended credit terms to foreign customers. In current liabilities of £537,181 (£268,211) the overdraft is £207,822 (nil).

The ordinary dividend is 16½ per cent (15 per cent).

C. E. Ramsden

Net profit of C. E. Ramsden and Co., manufacturers of colours and chemicals, for 1957 was £28,344 (£34,447). A dividend of 25 per cent (same) is being paid.

Coates Bros.

Group net profits of Coates Brothers and Co., printing ink, paint, varnish and resin manufacturers, are £46,470 higher having increased from £263,070 to £309,540 in the year ended 31 October last. After UK and Dominion taxes, the balance is £262,416 (£224,432). Parents net profit, including dividends from subsidiaries, is £234,485 against £194,650.

Final dividend is 12½ per cent on a capital increased by a scrip issue. The Interim was unchanged at 5 per cent and was paid on the smaller capital.

Inco of Canada

Consolidated net earnings of International Nickel Co. of Canada fell by 10 per cent from $US96.30 million to $86.14 million in 1957. These lower earnings are stated to be due in the main to the sharp fall in the price of copper.

Also adversely affecting last year's earnings were reduced sales of platinum metals, lower prices for platinum and an 11-week strike at the company's Huntington plant. These factors and continuing cost increases were partially offset by increased sales of nickel and copper and by higher prices for nickel.

For the eighth consecutive year the company operated at capacity. Nickel deliveries of 290 million lb. compared with 286.1 million lb. in the previous year, approximating to the 1955 record level. Deliveries of copper rose from 271.3 million lb. to 280.8 million lb.

In order to increase the company's annual nickel producing capacity to 385 million lb. in 1961, full scale development and construction work is progressing on schedule at its new nickel project in Manitoba.

Free world nickel supplies during the year rose to approximately 490 million lb., an increase of 40 million lb. over the previous high reached in 1956. Defence demands for nickel were substantially reduced and nickel under contract to the US Government was released to industry. Capital expenditures during 1957, at $43.9 million were the highest ever for the company. Expenditure this year is expected to total between $60 million and $70 million.

The outlook for 1958, according to the chairman, Dr. J. F. Thompson, is that customers will not take as much of Inco's production as they did last year. The long-term outlook for nickel, however, is described as excellent.

INCREASE OF CAPITAL

CHEMICALS AND FEEDS LTD., Adelaide House, King William Street, London EC4. Increased by £7,500 in £1 shares, beyond the registered capital of £35,000.

FAIRBANK KIRBY LTD., chemical manufacturers, etc., 7 Ropery Street, Grimsby. Increased by £5,000, in £1 preference shares, beyond the registered capital of £17,000.

HOECHST PHARMACEUTICALS LTD., Stoke Poges Lane, Slough, Bucks. Increased by £10,000 beyond the registered capital of £10,000.

MAXICROP LTD., fertiliser manufacturers, etc., Neptune House, Holdenby, Northants. Increased by £2,000 beyond the registered capital of £5,000.

RECKITT, COLMAN, CHISWICK (OVERSEAS) LTD., exporters of and dealers in starch, chemicals, etc., Dansom Lane, Hull. Increased by £999,900 beyond the registered capital of £100.

RECKITT AND SONS LTD., chemists, Dansom Lane, Hull. Increased by £2,999,900 beyond the registered capital of £100.

J. AND J. COLMAN LTD., chemists, Carrow Works, Norwich. Increased by £1,999,900 beyond the registered capital of £100.

NEW COMPANIES

ANTI-WOODWORM AND DRY ROT CO. LTD. Cap. £1,000. Directors: A. Rice, I. K. M. Lochhead, directors of British Rodent Exterminator Co. Ltd. Reg. office: 68 Victoria Street, London SW1.

FAIR LABORATORIES (SALES) LTD. Cap. £20,000. Consulting and analytical chemists and manufacturers and dealers for the foodstuff and provision industries, and cosmetic, pharmaceutical and oil trades, merchants, bankers, traders, commission agents, shipowners and carriers in the UK, Holland or elsewhere. Directors: A. E. M. Jansen, J. De Vos, and Henry A Jansen.

INORGANIC PLASTICS LTD. Cap. £6,000. Research and manufacturing chemists. Directors: B. A. Adams, R. G. Adams, A. H. Bethell, R. I. S. Tyley. Reg. office: Hayes Farm, Sully, Glam.

LINCOLNE, SUTTON AND WOOD LTD. Cap. £4,000. Analytical and consulting chemists and dealers in chemicals and scientific apparatus of all kinds. Subscribers. E. C. Wood, Mrs. M. W. Wood. Reg. office: Clarence House, 6 Clarence Close, Norwich.

MERRELL - NATIONAL (LABORATORIES) LTD. Cap. £50,000. Manufacturers of and dealers in pharmaceutical remedies and preparations, powders, soaps, cosmetics, etc. Dir.: F. W. P. Corbould, D. I. Wilson, A. Talbot, E. P. Anderson (US), J. K. Lindsay (US), and S. E. Silliman (US). Reg. office: 20 Savile Row, London W1.

SWAN'S CASA LTD. Cap. £100. To acquire the chemicals business relating to 'Wetfix' hitherto carried on at Crookhall Slag Works, Consett, Co. Durham, by Thomas Swan and Co. Ltd., and to carry on the business of manufacturers of and dealers in chemicals and chemical compositions, including additives for tars, bitumens, and bitumen emulsions and cationic surface active compounds used as oil solubles, emulsifiers, etc. Directors: T. Swan, and A. P. Hughes. Reg. office: Corone House, The Common, Chorleywood, Herts.

LONDON GAZETTE

Winding-up Petition

METALLO CHEMICAL TRUST CO. LTD. A petition for the winding-up of this company has been presented by A. Strauss and Co. Ltd., Plantation House, Mincing Lane, London EC3, and is directed to be heard at the Royal Courts of Justice, Strand, London WC2, on 31 March.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s. 3d. including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATION

Copies will be on sale 23 April or as soon as possible thereafter

Processes for preparing compounds of the cyclopentanopoly - hydrophenanthrene series. Merck & Co., Inc. **764 321**

ACCEPTANCES

Open to public inspection 23 April

Manufacture of 3-amino-indanes. Schering AG. [Divided out of and Addition to 793 852.] **793 853**

Preparing thiamin phosphoric esters. Istituto Sieroterapico Italiano Soc. Per Azioni. **793 753**

Preparation of high molecular weight addition polymers of formaldehyde. Du Pont De Nemours & Co., E. I. **793 673**

Removing uncondensible gases from chlorine. Stora Kopparbergs Bergslags Aktiebolag. **793 674**

Manufacture of aminocarboxylic acids. Inventa AG. für forschung Und Patentverwertung. **793 755**

De-watering solutions of organic acid esters of cellulose. Celanese Corp. of America. **793 861**

Organic nitrogen compounds and process for producing same. Parke, Davis & Co. **793 899**

Dyeing fibres of animal or vegetable protein, synthetic polyamides or polyurethanes. Badische Anilin- & Soda-Fabrik AG. **793 903**

Thiophosphoric acid esters and their preparation. Farbenfabriken Bayer AG. **793 758**

Method of and apparatus for detecting gaseous fission products in effluent liquid. Atomic Energy of Canada, Ltd. **793 905**

Linear polyesters of terephthalic acid and a process of producing them. Badische Anilin- & Soda-Fabrik AG. **793 907**

Production of 4-substituted 1, 2-diaryl 1-3, 5-dioxo-pyrazolidines. Geigy AG., J. R. **793 968**

Process and apparatus for the cold separation of gas mixtures. Union Carbide Corp. **793 681**

Organic titanium compounds. National Lead Co. **793 760**

Manufacture of monochloroacetic acid. Dow Chemical Co. **793 912**

Process and apparatus for forming fibres. Owens-Corning Fiberglas Corp. **793 913**

Production of polymeric materials from polyoxyalkylene polyols and organic polyepoxy compounds. Union Carbide Corp. **793 915**

Apparatus for delivering liquids by gaseous pressure to spraying devices. Hudson Manufacturing Co., H. D. **793 682**

Process and apparatus for separating gas mixtures. Union Carbide Corp. **793 762**

Production of sodium. Dow Chemical Co. **794 005**

Preparation of alkylene glycols. Dow Chemical Co. **793 766**

Continuous purification of liquids. Dorr-Oliver, Inc. **794 006**

Lubricating grease compositions. Esso Research & Engineering Co. **793 684**

Process for working up products containing the alkali salts of terephthalic acid. Henkel & Cie. Ges. **793 921**

Hydroforming with dealkylation of recycle aromatics. Esso Research & Engineering Co. **793 924**

Preparation of diacyl resorcinols. Dow Chemical Co. **793 770**

Preparation of dialkyl esters of terephthalic acid. Stamicarbon N.V. **793 926**

Receiving and handling molten material from a rotary kiln. Universal Atlas Cement Co. [Divided out of 793 613.] **793 614**

Open to public inspection April 30

Catalysts for fluorination. Cady, G. H. **794 022**

Process for production of uranium hexafluoride. Priest, H. F. **794 023**

Resin-impregnated filter paper. Wipac Development, Ltd. **794 183**

Lubricators for use in the continuous casting of high melting point metals. British Iron & Steel Research Assoc. **794 255**

Method of and installation for regulating the temperature of hot blast produced in a recuperator by means of the waste gases from a shaft furnace. Strikfeldt, W. S. **794 184**

Process for carrying out technical processes by glow discharges. Berghaus, B. **794 174**

Selective membranes of ion-exchange material and the production thereof. Stamicarbon N.V. **794 343**

Process and apparatus for treating ammoniacal gas liquor. Otto & Co. Ges., Dr. C. **794 105**

Granulating materials especially fertilisers. Fisons, Ltd. **794 030**

Heat conducting compositions. Middlesex Oil & Chemical Works. **794 107**

Production of mesityl oxide and like α-ethylenically unsaturated ketones. Soc. Industrielle des Derives de L'Acetylene, S.I.D.A. **794 344**

Water-soluble unsaturated polyesters and insoluble polymers obtained therefrom. General Electric Co. **794 032**

Production of synthetic filaments and threads. Imperial Chemical Industries, Ltd. **794 346**

Detergent compositions. Imperial Chemical Industries, Ltd. **794 036**

Method of treating noble metal and alumina catalysts with hydrogen and hydrogen halide. Houdry Process Corp. [Addition to 775 962.] **794 349**

Drying of adsorbent solids. Socony Mobil Oil Co., Inc. **794 350**

Coating of metals with polytrifluoro—chloroethylene. Connecticut Hard Rubber Co. **794 351**

Condensation process for organopolysiloxanes. General Electric Co. **794 119**

Preparation of steroid compounds. Glaxo Laboratories, Ltd. **794 335**

Process for the production of 9 β 11: β-epoxy-5α-steroids. Glaxo Laboratories, Ltd. [Divided out of 794 335.] **794 336**

Dyes of the nitro-diphenylamine series. Celanese Corp. of America. **794 176**

Dyes of the nitrodiarylamine series. Celanese Corp. of America. **794 177** **794 178**

Dyeing textile materials. Celanese Corp. of America. **794 179**

Heating installation for retort furnaces for producing gas and coke. Silamit-Indugas Gaswerksofenbau-Ges. **794 122**

Treatment of cellulosic textile materials. Imperial Chemical Industries, Ltd. **794 180**

Methods and means for water clarification and tailing filtration at coal washeries. Coal Industry (Patents), Ltd. **794 353**

Quinoline derivatives. Imperial Chemical Industries, Ltd. **794 043**

Fertilisers and the like. Fisons Ltd. **794 355**

Method for manufacturing detoxicated and stabilised vaccines of bacteria in the capsular state. Oshiro, T., and Naito, M. **794 018**

Production of typhoid dysentery vaccines. Oshiro, T., and Naito, M. **794 019**

Synthesis of 1, 4-dichloro-2, 3-butanediol butadiene dioxide. Union Carbide Corp. **794 209**

Process for the production of aluminium hydrocarbons. Ziegler, K. **794 359**

Regenerated cellulose film and processes for producing same. Du Pont de Nemours & Co., E. I. **794 358**

Process for the dihalogenation of acrylic acid esters and their homologues. Herschmann, C. **794 360**

Process for the production of foamed products. Farbenfabriken Bayer AG. **794 051**

Chromium-complexes of monoazo-dyestuffs. Sandoz, Ltd. **794 053**

Manufacture of water gas. Power-Gas Corp. **794 054**

Diphenyl compositions. Monsanto Chemicals, Ltd. **794 274**

Synthetic linear polyterephthalamides. British Nylon Spinners, Ltd. **794 365**

Polyazo Dyestuffs. Sandoz, Ltd. [Addition to 760 705.] **794 366**

Process for cracking hydrocarbons in the liquid state. Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. **794 367**

System and method for dehydrogenation. Houdry Process Corp. **794 089**

Metallisable monoazo dyestuffs of the benzene-azo-8-hydroxyquinoline series. Imperial Chemical Industries, Ltd. **794 059**

Method of and apparatus for scrubbing gases. Farbenfabriken Bayer AG. **794 060**

Electrolytic treatment of waste sulphate pickle liquor. Rohm & Haas Co. **794 368**

Water-insoluble monoazo dyestuffs containing cyanogen groups. Farbenfabriken Bayer AG. [Adddition to 760 750.] **794 135**

Manufacture of polyurethane materials. Imperial Chemical Industries, Ltd. **794 061**

Filters for liquids or gases. Muller, J. **794 372**

Manufacture of continuous non-fibrous, regenerated cellulose sheet material which is subject to shrinkage during drying. Du Pont de Nemours & Co., E. I. **794 012**

Production of epoxy compounds. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **794 373**

Manufacture of regenerated cellulose sheet material. Du Pont de Nemours & Co., E. I. **794 013**

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £136.

Alum, Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18 10s.

Ammonia, Anhydrous. Per lb., 1s 9d,-2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £27 to £30 2s 6d.

Ammonium Nitrate. D/d, 4-ton lots, £31.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 7d to 5s 0½d; golden, 2s 10½d to 4s 3½d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £43.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £68; gran., £46; crystal, £48 10s; powder, £49 10s; extra fine powder, £50 10s; BP, gran., £55 10s; crystal, £57 10s; powder, £58 10s; extra fine powder, £59 10s. Most grades in 6-ply paper bag, £1 less.

Boric Acid. Ton lots, in hessian sacks, c.p. Tech., gran., £76 10s; crystal, £84 10s; powder, £82; extra fine powder, £84; BP gran., £89 10s; crystal, £96 10s; powder, £94; extra fine powder, £96. Most grades in 6-ply paper bag, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack: solid and flake, about £15.

Chlorine, Liquid. In ret. 16-17-cwt. drums d/d in 3-drum lots, £40.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2½d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. 1-cwt. lots, per cwt., £11 5s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 3s.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £66.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £39 10s.

Formic Acid. 85%, in 4-ton lots, c.p., £89.

Glycerine. Chem. pure, double distilled 1,260 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £10 1s 6d. Refined pale straw industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 2s 3d per lb.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £128 10s; 35% wt., d/d, £158.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 4d; for 1-cwt. lots, per lb., 13s 5d.

Iodoform. Under 1 cwt., per lb., £1 2s 11d, for 1-cwt. lots, per lb., £1 2s 3d.

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc.

Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £106 10s; orange lead, £118 10s. Ground in oil: red, £127 5s, orange, £139 5s.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £118; Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-ton lots, £108 10s.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 1s 9d; smaller quantities dearer.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 10s 6d.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £129.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb. 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Crystals and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2½d.

Potassium Iodide. BP, under 1-cwt., per lb., 9s; per lb. for 1-cwt. lots, 8s 6d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11½d; 3-cwt. lots, per lb., 1s 10¾d; 5-cwt. lots, per lb., 1s 10½d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.

Salammoniac. Ton lot, in non-ret. pack, £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 4d to 2s 6d., 1-ton lots.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £17 3s.

Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.

Sodium Acetate. Comm. crystals, d/d, £91.

Sodium Bicarbonate. Ton lot, in non-ret. pack., £16 10s.

Sodium Bisulphite. Powder, 60/62%, d/d, 2-ton lots for home trade, £46 2s 6d.

Sodium Carbonate Monohydrate. Ton lot, in non ret. pack, c.p., £57.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £88 10s.

Sodium Cyanide. 96/98%, ton lot in 1-cwt drums, £113 5s.

Sodium Dichromate. Crystals, cake and powder, per lb., 1s. Net d/d UK anhydrous, per lb., 1s 1½d. Net. del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £34 15s.

Sodium Iodide. BP, under 1 cwt., per lb., 14s 1d; 1-cwt. lots, per lb., 13s 2d.

Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.

Sodium Metasilicate. (Spot prices) D/d UK in 1 ton lots, 1 cwt. free paper bags, £27 10s.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., £29 10s.

Sodium Nitrite. 4-ton lots, £32.

Sodium Perborate. (10%0) in 1-cwt. free kegs, ton lots, £145 15s.

Sodium Percarbonate. 12½% available oxygen, per cwt., in 1-cwt. kegs, £8 10s 9d.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. (Spot prices) 75-84° Tw. Lancs and Ches., 4-ton lots, d/d station in loaned drums, £11 17s 6d; Dorset, Somerset and Devon, per ton extra, £3 17s 6d; Scotland and S. Wales, extra, £3. Elsewhere in England, not Cornwall, extra, £1 12s 6d.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £20.

Sodium Sulphate [Glauber's Salt]. D/d, £18 10s to £18 15s.

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £10 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £10 10s.-£12 2s 6d; 140° Tw., arsenic free, £8 15s.; 140°Tw., arsenious, £8 9s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, £14; 1 cwt., £14 5s.

Titanium Oxide. Standard grade comm., rutile structure, £178; standard grade comm., anatase structure, £163.

Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £90 10s; green seal, £88 10s; red seal, £85 10s.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128 in 10-gal. drums, £118; in 40-45-gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £173.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £152.

***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-4-5 gal. drums, under 1 ton, £133; 1-5 tons, £130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125.

tert-**Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.
Diacetone Alcohol. Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148; 1-5 tons, £147; 5-10 tons, £146; 10 tons and over, £145, in 400 gal. tank wagons; £142.
Dibutyl Phthalate. In drums, 10 tons, d/d, per ton, £222; 45-gal. drums, d/d, per lb., 2s ½d.
Diethyl Phthalate. In drums, 10 tons, per ton, £187 10s; 45-gal. drums, d/d, per lb., 1s 9d.
Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £179, 45-gal. drums, d/d, per lb., 1s 8d.
Dioctyl Phthalate. In drums, 10 tons, d/d, per lb., 2s 8d; 45-gal. drums, d/d, per lb., 2s 9½d.
Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.
Ethyl Acetate. 10-ton lots, d/d, £145.
Ethyl Alcohol [PB 66 o.p.]. Over 300,000 p. gal. 4s 0½d; d/d in tankers, 2,500-10,000 p. gal., per p. gal., 4s 2½d. D/d in 40/45-gal. drums, p.p.g. extra, 1d. Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.
Methanol. Pure synthetic, d/d, £43 15s.
Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 10½d; 100-499 gal. in drums, d/d, per gal., 6s 3d-6s 5d. Pyridinised 66 o.p. : 500 gal. and up, in tankers, d/d, per gal., 6s 2d; 100-499 gal. in drums, d/d, per gal., 6s 6½d-6s 8½d.
Methyl Ethyl Ketone. All d/d. In 5-gal drums, £183; in 10-gal. drums, £173; in 40-45-gal. drums, under 1 ton, £148; 1-5 tons, £145; 5-10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.
Methyl *iso*Butyl Carbinol. All d/d. In 5-gal. drums, £203 ; in 10-gal. drums, £193 ; 40-45 gal. drums, less than 1 ton, £168 ; 1-9 tons, £165 ; 10 tons and over, £163 ; in 400-gal. tank wagons, £160.
Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40-45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.
***iso*Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.
***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40-45 gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.
Carbon Black. Per lb., according to packing, 8d-1s.
Carbon Tetrachloride. Ton lots, £83 15s.
India-Rubber Substitutes. White, per lb., 1s 8¾d to 2s 0½d; dark, d/d, per lb., 1s 3d-1s 5½d.
Lithopone. 30%, about £59.
Mineral Black. £7 10s-£10.
Sulphur Chloride. British, about £50.
Vegetable Lamp Black. 2-ton lots, £64 8s.
Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL-TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s 3d; pure, 5s 7d.
Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ½d. Crude, 60's, per gal., 8s 4d.
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s 4d.
Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d.
MANCHESTER: Per gal., 1s 2d-1s 8d.
Cresylic Acid. Pale 99/100%, per gal., 6s 6d; 99.5/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 8d to 9s 3d; per US gallon, c.i.f. NY, 100 to 118.5 cents freight equalised.
Naphtha. Solvent, 90/160°, per gal., 5s 3d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.
Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65-£66.
Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.
Pyridine. 90/160, per gal., 15s.-17s 6d.
Toluole. Pure, per gal., 5s 6d; 90's, d/d, 2,000 gal. in bulk, per gal., 5s.
MANCHESTER: Pure, naked, per gal., 5s 6d.
Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 6s 2d-6s 6d.

INTERMEDIATES AND DYES

(Prices Nominal)

m-**Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.
o-**Cresol** 30/31°C. D/d, per lb., 1s.
p-**Cresol** 34/35°C. 10 cwt. lots d/d, per lb., 5s.
Dichloraniline. Per lb., 4s 6d.
Dinitrobenzene. 88/99°C., per lb., 2s 1d.
Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.
p-**Nitraniline.** Per lb., 5s 1d.
Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots d/d, per lb., 10d.
Nitronaphthalene. Per lb., 2s 5½d.
o-**Toluidine.** 8-10-cwt. drums (drums extra), per lb., 1s 11d.
p-**Toluidine.** In casks, per lb., 6s 1d.
Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

Market Reports

BUYERS HESITATE ON FORWARD BUSINESS

LONDON There has again been little change in the industrial market, and while movement under existing commitments is up to schedule, buyers are hesitant to cover more than nearby requirements. Export trade enquiry remains good despite increasing competition from Continental producers. There have been no outstanding price movements and the undertone in most sections of the market is firm.

The demand for fertilisers is now in full swing and deliveries are expected to be under pressure during the next few weeks. On the coal-tar products market business remains largely of a routine nature with the bulk of the movement against contracts.

MANCHESTER Quotations for heavy chemicals during the past week have been on a steady to firm basis throughout the range, and little actual change is reported. There is room for improvement in the demand from the textile bleaching, dyeing and finishing trades, but most other industrial consumers are taking reasonably good deliveries against contracts. A fair flow of enquiry on both home and shipping accounts is being dealt with. The call for fertiliser materials continues to improve in several sections, and a steady call for most of the light and heavy tar products has been maintained.

GLASGOW The past week showed little change in the trading position of industrial chemicals in the Scottish market. Demands were moderate and steady, mainly against current requirements. Contract deliveries have been reasonably well maintained. Little or no change in prices has to be reported.

The overseas market is still considerably active with the usual volume of varied enquiries being received. A little more interest has been shown in agricultural chemicals.

Analytical Reagents for Uranium

To supply the need for special reagent grade chemicals controlled for fluorescent impurities, J. T. Baker Chemical Co. of Phillipsburg, New Jersey, US, through their UK agents, Omni (London) Ltd., 35 Dover Street, London W1, tel. Hyde Park 9451, are offering the following in a special fluorimetric grade: aluminium nitrate, lithium fluoride, and sodium fluoride.

Specification for aluminium nitrate—fluorimetric grade—is as follows: assay (as $Al(NO_3)_3.9H_2-$); 98.0–102.0 per cent; fluorescent test, passes test; insoluble matter 0.005 per cent; pH of 5 per cent solution at 25°C, 2.5 to 3.5 per cent; chloride (Cl), 0.001 per cent; sulphate (SO_4), 0.005 per cent; heavy metals (as Pb) 0.001 per cent; iron (Fe), 0.002 per cent; earths and alkalis (as SO_4) nil. This reagent meets ACS reagent specifications and is controlled to a uranium equivalence of less than 0.1 parts per hundred million as U_3O_8 (shown on label as 'Passes Test'). Actual lot analysis and assay is shown on each label.

Lithium fluoride and sodium fluoride—fluorimetric grade—both meet ACS reagent specifications. Sodium fluoride is controlled to a minimum assay of 99 per cent sodium fluoride and both products are stated to offer defined purity as shown by actual lot analyses on each. When these reagents are employed as 98 per cent sodium fluoride —2 per cent lithium fluoride mixture, the total uranium equivalence is stated to be less than 5 parts per hundred million.

Chemical Stocks and Shares

A FUTURE IN PLASTICS

UNTIL the Bank Rate change on 20 March markets over the last two weeks had been rather subdued by the irregularity of Wall Street and the busman's reaction to the wages award and the new wages demand from the railwaymen. Last week after the overdue reducing of the crisis Bank Rate of 7 per cent the first reaction of the market was to mark prices up, but as expected investors have been cautious and have yet to weigh up the situation.

On the whole, the change of policy must be considered well-advised, and it appears that the Government's battle against inflation is being won.

Albright and Wilson improved to 19s 9d on the increased dividend and profits and proposed scrip issue. ICI, in front of their final dividend announcement to be made on Thursday, have been active round 40s 7½d, but generally prices have had no significant movement.

The plastics industry, although comparatively young, has developed and made dynamic strides over the last 10 years. The following three companies set out below are the leaders in this vast field whose shares give as comprehensive a coverage as any to be found elsewhere.

	Approx. price	Dividend	Yield
Bt. Xylonite £1	30/–	11%	7.3
BI Plastics 2s	5/–	20%	8.0
Bakelite 10s	17/–	15%	8.5

British Xylonite were one of the founders of the plastics industry, and have increased their turnover in excess of £10 million compared with £6 million in 1950.

The really potent investment consideration in all these companies is the fact that the scope for expansion and turnover is now sufficient to swallow increased operating costs and still leave sufficient margin for a higher level of net earnings each year. Given stabilisation in operating costs, profits could fairly leap ahead in these circumstances.

BI Plastics made their name with Beetle moulding powders used by so many industries. It is this factor which has given this company such a satisfactory growth record and which ensures it a much sounder trading outlook than might perhaps be the case if it were wholly engaged in manufacturing plastics articles for the domestic market.

Bakelite are another of the pioneering concerns in this industry. These three shares all offer attractive yields together with excellent growth prospects.

1957/8 High	1957/8 Low	Security	Mar. 24	Change over last two weeks
23/7½	16/4½	Albright & W. 5/–	19/9	+1/10½
11/6	10/6	Anchor 5/–	10/9	—
1/3	1/–	Ashe 1/–	1/1½	—
7/10½	4/6	Berk, F. W. 5/–	4/7½	—
36/–	14/10½	Borax 5/– Dfd.	16/7½	+7½d
10/9	8/10½	Bt. Chrome 5/–	8/9	—6d
13/10½	10/3	Bt. Glues 4/–	11/6	+1/–
8/6	5/6	Bt. Tar 2/6	7/10½	—
4/4½	3/6	Coalite 2/–	4/1½	+6d
60/3	45/9	Fisons	47/9	—6d
34/6	24/1½	Hickson & W. 10/-	30/9xD	—1/3
46/6	36/1½	ICI	40/7½	—1/4½
4/9	2/6	Kleeman 1/–	3/–	—
15/7½	14/–	Laporte 5/–	15/7½	+9d
22/–	13/9	Lawes 10/–	13/9	—
19/3	12/4½	Monsanto 5/–	13/1½	—
15/6	11/–	Reichhold 5/–	12/6	—
11/9	8/9	Yorkshire Dye 5/–	8/9	—

TRADE NOTES

International Instrument Show

The fourth international instrument show, organised by B and K Laboratories Ltd., opened last week. Held at the Caxton Hall, Westminster, London, from 24 to 29 March, 70 stands showed the latest developments from many well-known Continental and US companies.

Prize-winning Modification

A suggestion for the modification of valves used in pipeline carrying acidic liquors won Mr. J. Ainsworth, of Peter Spence Ltd., a prize of £20 in a competition organised by Warrington Productivity Committee. His employers report a reduced maintenance time and a substantial decrease in the loss of liquor through seepage since they adopted the suggestion. Another prize of £5 was awarded to Mr. W. R. Glover of Pilkington Bros. Ltd. for a suggested alteration to sandwash machines used in glass making.

Change of Address

Associated Lead Manufacturers Ltd. have changed their address to Clements House, 14-18 Gresham Street, London EC2 (Monarch 4400).

Machinery (Continental) Ltd., distributors of Continental chemical plant, have changed their address from 175 Brompton Road, London SW3 to 42 Park Street, Mayfair, London W1.

DIARY DATES

MONDAY 31 MARCH

SCI (Yorkshire Section)—Leeds: Hotel Metropole. 6.30 p.m. AGM. 7 p.m. 'Titanium—production and uses' by G. T. Harris.

WEDNESDAY 2 APRIL

SAC—London: Chemical Society, Burlington House, Piccadilly W1. 6.30 p.m. 'Polarography'.

SAC—London: Chemical Society, Burlington House, Piccadilly W1. 7 p.m. Meeting on 'Gas chromatography'. Introduction by C. S. G. Phillips. 'Applications of gas chromatography in the halogenated hydrocarbon field' by R. Hill and 'Gas chromatography in the petroleum industry' by D. H. Desty.

THURSDAY 3 APRIL

Polarographic Society—London: 'Duke of York', Dering Street W1. 7 p.m. 'Some problems associated with organic reductions at the dropping mercury electrode' by H. Schweitzer.

Potatoes Said to Taste of Mothballs

IN ADDITION to experimental work in the chemical industry, research on the possible harmful residues from chlorinated and phosphorated chemicals in foodstuffs is being carried out by the Government Chemist's department in co-operation with the Ministry of Agriculture. This was stated on Monday by Mr. J. B. Godber, Joint Parliamentary Secretary to the Ministry of Agriculture. He was not aware that use of chemicals instead of humus had given potatoes a taste of mothballs, but offered to look into any complaints in this respect.

Shale Oil Experiments in Scotland

An experiment designed to extract oil from Scottish shale mines by a simpler and cheaper process, is to be carried out by Scottish Oils for the Ministry of Fuel and Power at Winchburgh (West Lothian). Plant is being erected to sink bores to the deposits with the object of igniting the shale underground. If the theory works, vapour from the borings should condense at ground level into crude oil, which can be refined to give besides refined fuel, waxes, naphtha and sulphuric acid.

Ralph Lawton Ltd.

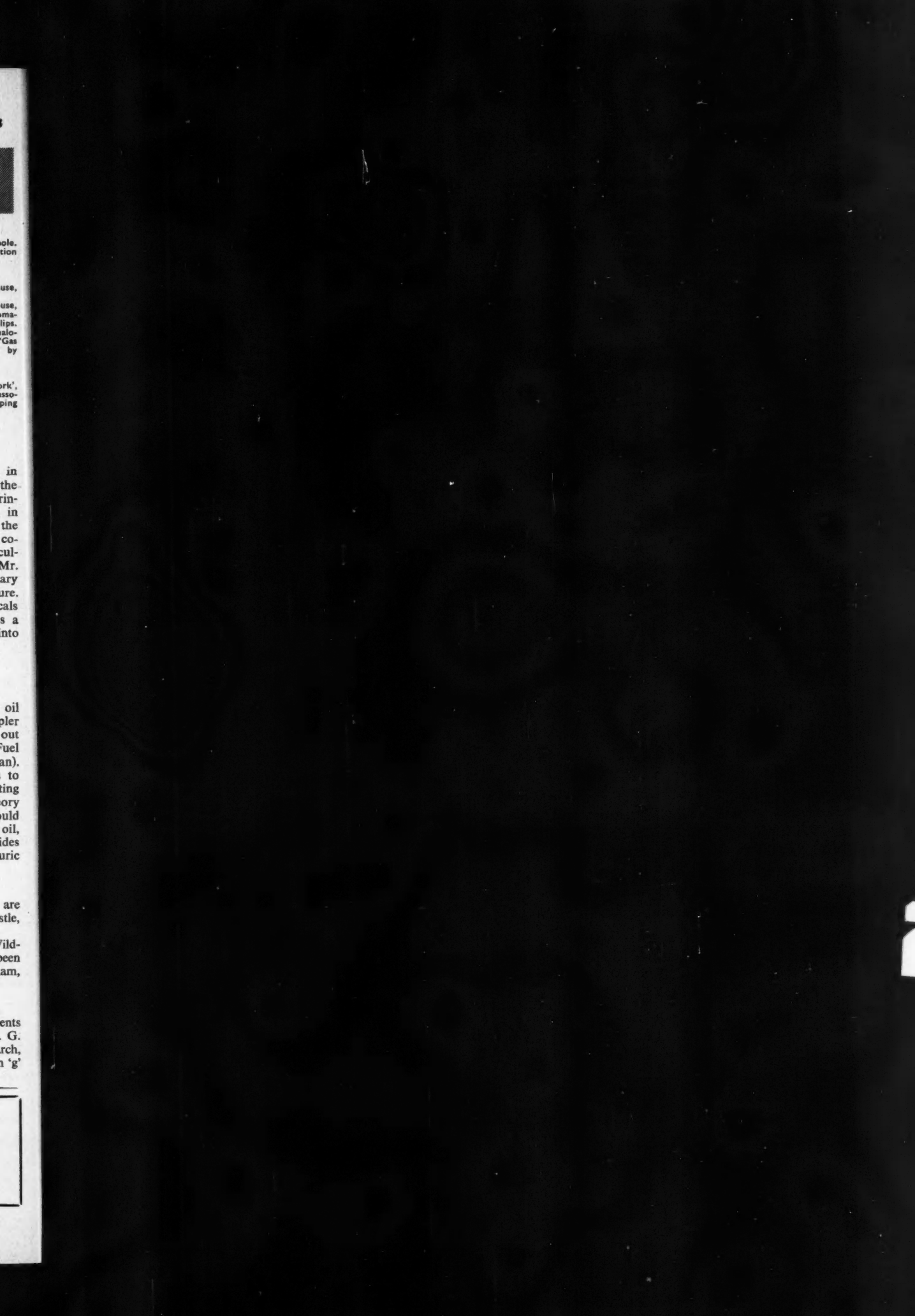
New works of Ralph Lawton Ltd. are at Rose Vale, Chesterton, Newcastle, Staffs, telephone Newcastle 68073.

Address of the Midlands office of Wild-Barfield Electric Furnaces Ltd. has been changed to 71 Broad Street, Birmingham, 15. Telephone Midland 7232.

High Efficiency Filter

Owing to a print error the measurements of acidity quoted in the paper by Mr. G. Lowrie Fairs (CHEMICAL AGE, 15 March, p. 499) appeared with the abbreviation 'g' for grains instead of 'gr.'

"VULCAN" BRAND IRON AND STEEL CARBOY HAMPERS SAFETY CRATES, PACKED CARBOYS

HARRIS (LOSTOCK GRALAM) LTD.

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